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REMOVING SEDIMENT FROM BASIN OF THE KANSAS CITY, MO., WATER PURIFICATION PLANT.

OPERATION OF SMALL RAPID SAND FILTERS

Plain and Full Descriptions of Details—Determining the Proper Quantities of Coagulants and of Hypochlorite for Varying Conditions of Turbidity, Color and Alkalinity—Purchasing, Mixing and Applying Chemicals.

By H. P. SETTON.†

In connection with the operation of small rapid sand filters, the writer has felt for some time the need of a discussion of the whole problem from the viewpoint of the man in direct charge of the operation.

As he pointed out in a paper recently presented before the New England Water Works Association,* small water purification plants are often poorly designed and more often poorly operated. The operator is not, as a rule, responsible for the design and while in the matter of operation he often makes mistakes, they are in the majority of cases due, not to carelessness or neglect, but to ignorance or lack of training.

A rapid sand filter cannot be operated by any set rule, day in and day out, for the reason that the character of the water to be treated does not remain constant. Moreover any set of rules which might work successfully in one location would perhaps prove an absolute failure in another.

With the above facts in mind, an attempt will be made in the following discussion to outline the best methods of operation as shown by the writer's experience. The processes will be taken up in regular sequence, beginning with chemicals and coagulation, and each step will be discussed thoroughly before going to the next.

The matter presented is designed to be particularly useful to the small plant having no laboratory control, as this is the type most generally mismanaged. It is believed, however, that those in charge of larger plants may find something of profit in the comparison of their methods with those given here.

*Small Water Purification Plants: A Plea for Their More Efficient Operation. Journal, New England Water Works Association, Vol. 27, No. 4, December, 1913. Also Municipal Journal, January 22, 1914.

†Sanitary Engineer, Hygienic Laboratory, United States Public Health Service.

CHEMICAL TREATMENT.

Coagulation and Coagulating Chemicals.—The question of proper coagulation and sedimentation, which is of prime importance in the operation of rapid sand filters, is often the least understood of all the steps in the process and therefore receives less attention than it should.

In order to effect efficient removal by the filter of either bacteria, turbidity or color, it is essential that a good precipitate be formed which will settle and drag down with it a large per cent of all the above substances and yet leave enough flock in the water entering the filters to form a suitable slime layer on the surface of the sand.

By far the greater number of small plants use sulphate of alumina as the coagulant, and this discussion will therefore be confined to that chemical.

In order that coagulation or precipitation may take place it is necessary that the raw water contain sufficient alkalinity to combine with the sulphate of alumina and form the flocculent aluminum hydrate. By alkalinity is meant the temporary hardness of the water. It is usually expressed in parts per million of calcium carbonate. Many waters contain at all times alkalinity much in excess of that needed to effect coagulation, while others vary greatly at different times. In most streams the alkalinity is the lowest at times of greatest flow with its resultant high turbidity. For this reason alkalinity tests should be part of the regular routine operation. The test is not a difficult one, requires but a small amount of apparatus, and with a little practice can be carried out by the filter attendant. The apparatus and solutions needed and the method of making the test as prescribed by the "Standard Methods of Water Analyses" of the American Public Health Association are given below. (The book just mentioned should be in the hands of every man in charge of the operation of a rapid sand filter plant.)

The apparatus needed for the alkalinity test is as follows: One glass stoppered bottle holding about 250 cubic centimeters, one burette for titrating, one 5 cubic centimeter pipette, one 2½ cubic centimeter pipette, one 100 cubic centimeter graduate. The technique of making the test is as follows: 100 c.c. of the water to be tested is placed in the bottle; to this is added 2½ c.c. of erythrosine solution (0.1 gram of the sodium salt in one liter of water), and 5 c.c. of chloroform (neutral to erythrosine). The mixture should now be well shaken and, if the pink color persists, fiftieth normal (N/50) sulphuric acid should be added from the burette, a little at a time, shaking thoroughly each time until the pink color disappears. Each 0.1 cubic centimeter of sulphuric acid used is equivalent to one part per million of alkalinity expressed in terms of calcium carbonate.

One grain of sulphate of alumina per gallon will theoretically reduce the alkalinity about 8 parts per million. When treating waters with high turbidity, however, it is often found that this theoretical amount is much reduced, probably because the turbidity absorbs a certain amount of the chemical before coagulation takes place. In conditions such as this it will be found advisable to add a small amount of chemical and then, after a period of sedimentation, to add another small amount.

It is essential that the water be alkaline after treatment, as otherwise free alum will be found in the water. Free alum is detrimental to health, besides rendering the water extremely corrosive and also preventing its use in some industrial processes, such as dyeing. It sometimes happens, when large amounts of chemical are added to a very turbid water, that the alkalinity is not all used up, but the water nevertheless contains free alum. At such times, or whenever the presence of free alum is suspected, the following simple test will be found convenient: Fill a test tube half full of filtered water. Add four or five drops of Haematoxylin solution (1.0 ounce Haematoxylin to 8.0 ounces of water), or sufficient to give a bright red color, and then add one drop of dilute acetic acid. If the water is free from alum, the color on the addition of the Haematoxylin will be bright red, which on the addition of the acetic acid will turn to a straw yellow. If there is alum present, the color on the addition of the Haematoxylin will vary from a greenish brown to a bluish black, which will not change on the addition of the acetic acid. This test will show free alum in the proportion of one part in five million.

In order that the filtered water shall always be alkaline, it is not advisable to add more sulphate of alumina than will reduce the alkalinity three-fourths. If this amount of chemical is insufficient for proper coagulation, it will be necessary to artificially increase the alkalinity. This is generally effected by adding to the raw water a solution of soda ash or crude sodium carbonate. One grain per gallon of this chemical is equivalent to about two grains per gallon of sulphate of alumina.

There are numerous brands and grades of these two chemicals on the market at varying prices, but it is believed to be economy to buy a good quality, especially of sulphate of alumina. The following specifications (which are a modification of the ones proposed by Whipple and Longley†) call for a chemical of high grade. These specifications, or very similar ones, are used in buying the chemical by almost all of the larger plants and should be adopted by the small ones also. It would be well to buy in large quantities and have the shipment tested to determine whether the specifications are being followed. The specifications are:

The basic sulphate of alumina shall be guaranteed to contain 17.5 per cent of alumina (Al_2O_3), soluble in water, and of this amount at least 5 per cent shall be in excess of the amount theoretically necessary to combine with the sulphuric acid present. It shall not contain more than 0.5 per cent of iron (Fe_2O_3), and the iron shall be preferably in the ferrous state. The alum shall be crushed to pieces of such a size that they will pass through a ring three inches in diameter.

Solution Tanks.—The solution tanks, whether of wooden or concrete construction, should be provided in duplicate. The best method of dissolving the chemicals is to have in the top of the tank a V-shaped trough, either of wood or concrete, of a sufficient size to hold the necessary amount of chemical for a tankful of solution. Above and parallel with this trough should be a water pipe, perforated with numerous small holes, one row pointing directly downwards and a row pointing towards each side of the trough. By this method it is possible to so regulate the flow of water over the chemical that it will all be dissolved by the time the tank is full. If some such method is not used with the soda ash and instead it is dumped into a tank of water, it will crystallize and form a very hard, almost insoluble, mass in the bottom of the tank.

After the chemicals are entirely dissolved, the solution should be thoroughly agitated for a few minutes in order to make it uniform throughout. This can be done in small tanks, either by simply stirring with a stick or by a hand-operated paddle arrangement. A convenient method in those plants using compressed air for washing the filters is to have in the bottom of the tanks a series of perforated brass pipes through which air can be blown, thus thoroughly mixing the solution. Piping for handling the alum solution should be preferably lead or brass, as iron pipe is quickly corroded. Whatever kind of pipe is used, there should be inserted numerous unions and plugged tees and crosses to facilitate cleaning. If convenient, there should be a connection to a water

†Journal of Infectious Diseases, Sup. No. 3, May, 1907.

pipe, as this makes possible the thorough flushing of the chemical lines whenever needed. Iron pipes are satisfactory for the soda ash solution.

Calcium Hypochlorite.—While treatment of the water with calcium hypochlorite is really not a part of the filtration process, its use in connection with rapid sand filters has become so general that the methods of handling it will be discussed at this point.

The chemical when fresh is a dry powder containing about 35 per cent available chlorine. It is generally furnished in steel drums holding either about 350 or 700 pounds. After standing open for some time, the chemical takes up considerable water, and the per cent of available chlorine decreases. For small plants it will be found economical to pay slightly more for the chemical and have it packed in smaller containers, say holding 100 pounds. The percentage of available chlorine in the powder should also be determined, as otherwise doses much less than intended are liable to be added. The test is not a difficult one, and if the reagents are made up by a chemist the plant attendant can carry out the determination. The preparation of the solutions and the methods of testing are described quite fully on page 72 of Water Supply Paper No. 315 of the United States Geological Survey, entitled "The Purification of Public Water Supplies." This pamphlet, which can be obtained without cost, will prove of value to all interested in the subject. Whether the powder is tested or not, the solution actually fed to the water should be, as this is the only way to know the actual rate of application.

Tanks for hypochlorite solutions should be made of concrete or iron. Concrete is the best, as it is not attacked by the solution. Wooden tanks are quickly destroyed by the action of the chemical, but if only wooden tanks are available they may be made satisfactory by being lined with a layer of cement mortar plastered over a layer of chicken wire netting or metal lathing which is nailed to the sides of the tank.

Lead piping should preferably be used for carrying the solution, but whatever pipe is used the same precautions against stoppages mentioned under alum tanks should be adopted.

The chemical is soluble in about twenty times its weight of water, but it is not advisable to use it in more than a 2 per cent solution. For the plant treating less than a million gallons per day it will be better to use a one or a one-half per cent solution, as it is extremely difficult to regulate the small flow necessary with the stronger solution.

The solution tanks should be provided in duplicate, and each should be capable of holding enough solution to run about twelve hours. The following table will be found convenient in determining the size of solution tanks needed and the rate of feeding the solution:

Parts per million available chlorine	0.2	0.4	0.6	0.8	1.0
Pounds of hypochlorite per million gallons	5	10	15	20	25
Gallons of water to make a one per cent solution	60	120	180	240	300
Gallons of one per cent solution to be fed per hour per million gallons per day	2.5	5.0	7.5	10.0	12.5

Suppose it is desired to treat 550,000 gallons of water per day at the rate of 0.4 part per million available chlorine using a one-half per cent solution. From the table, opposite the required amount of chlorine, it is seen that 10 pounds of chemical and 120 gallons of water are required for a million gallons using a one per cent solution. With a one-half per cent solution 240 gallons of water would be required. Since it is wanted to treat 550,000 gallons, there would be required for one day 0.55 of 240 gallons, or 132 gallons of water, and 0.55 of 10 pounds, or 5.5 pounds of chemical. This would need to be fed at the rate of 5.5 gallons per hour, or a pint every minute and 22 seconds.

For the small plant the best method of making the solution is to mix up a paste of the chemical, using at least a half gallon of water for each pound of hypochlorite. This paste can then be put in the solution tank and diluted to the required quantity. The most important point to be observed is to get all the available chlorine dissolved. This requires that the solution be agitated for some time after mixing. If the mixing is thorough, there will be little active chlorine left in the sludge which settles in the bottom of the tank. It is advisable to have the draw-off pipe opening about four inches above the bottom of the tank, as in this way the clear solution can be drawn off without disturbing the sludge. This sludge should be flushed out at intervals to prevent its getting into the solution pipes and causing trouble by clogging the regulating orifice.

Amount of Chemicals to Be Added.—The necessary amount of sulphate of alumina to be added to a water depends on several different things. If a clear colorless water is being treated for the removal of bacteria, only enough chemical is needed to form a flock which will deposit on the filter and prevent the passage of the bacteria. As a general rule, 0.5 grain per gallon will suffice for this purpose. When a water is turbid, the amount needed will depend on the amount of turbidity. In a properly operated plant the turbidity is measured at least once a day, and the chemical dose regulated from this measurement. For turbidities under 100 the most simple arrangement for reading the turbidity is to have a series of standard clay turbidities prepared in pint bottles, a good series being turbidities of 10, 20, 30, 40, 50, 75 and 100. The standards should be prepared in accordance with the Standard Methods of Water Analyses mentioned heretofore. The writer is quite certain that, in those states where the state board of health has a laboratory, it would be more than willing to prepare standards of this kind without charge, unless for the materials, which would be very little. When the writer was in the employ of the New Jersey State Board of Health he had standards of this kind prepared and furnished to all the plants of the state that did not have a laboratory in connection therewith. In return, the daily records of turbidity and chemical added were reported once a month. Where the turbidity is over 100, the above standards can be used by diluting the water to be tested with clear water and taking account of this fact in figuring the turbidity. Unless this is done, a candle turbidimeter, as used by the U. S. Geological Survey, will be required. At one plant in New Jersey the man in charge made his own standards by filling bottles with the actual raw water at times of different turbidity. He found by experience the necessary amount of chemical for each turbidity and thereafter regulated the dose according to these standards. This is a satisfactory method, but its objection is that the results cannot be compared with other plants.

The following table from the American Civil Engineers' Pocket Book, page 928, will be found valuable in approximating the necessary amount of chemical.

Since conditions vary so much, it is probable that these quantities will not give just the right reaction in every case. For this reason a similar table should be prepared at every plant in accordance with actual conditions found. After this is done the chemical dose can be regulated from the turbidity readings.

What has been said with regard to turbidity applies

Average Amounts of Sulphate of Alumina Necessary to Use for Different Turbidities and Color.

	Alum		
Turbidity.	Grains per gallon.	Pounds per million gallons.	Alkalinity necessary for reaction. Parts per million.
0	0.50	72	5
50	1.00	143	9
100	1.35	193	12
200	1.78	254	16
300	2.05	293	18
500	2.50	357	22
700	2.87	413	25
1,000	3.32	474	30
1,500	3.39	557	34
2,000	4.40	628	38
Color.			
50	1.00	143	9
100	2.00	286	17
200	4.00	572	35

equally well to those plants whose chief aim is to remove color. The color of water does not, as a rule, fluctuate as rapidly or as much as turbidity, but it is much harder to remove. Color standards similar to those described for turbidity are in use at several New Jersey plants. The removal of color generally requires more chemical than for turbidity and longer periods of coagulation. Unfortunately waters highly colored with organic matter are usually very low in alkalinity, many times even being of acid reaction due to humic acid from the swampy areas in which the water rises. A color of 10 can just be noticed in a glass of water on a white cloth, while a color of 25 or over is very striking. It is absolutely essential that a plant handling a water of this type be regulated in accordance with alkalinity and color determinations. Without such regulation there is great danger of having free alum in the filtered water; while if soda ash and alum are added in such uniform quantities as to never have this happen, the plant is not being economically operated. Besides this, larger doses of sulphate of alumina make the water corrosive, causing the unpleasant "red water" troubles in house piping. Because of this fact and because it is good business, the chemical dose should be kept as low as is consistent with proper color removal. This is only possible with careful operation based on the tests mentioned above.

In plants handling waters almost always turbid or colored, if sufficient chemical is used to effectively remove the turbidity or color, the bacteria removal will generally take care of itself. In other words, more chemical is needed to remove turbidity and color than to remove bacteria. In fact, a water slightly turbid is much easier to treat than a clear water, as the settling of the turbidity drags down with it the greater part of the bacteria. This action has been taken advantage of at a few plants by adding to the clear water entering the coagulation basin a mixture of clay and water, thus causing an artificial turbidity. This is particularly applicable in starting coagulation in a clear colored water.

The amount of hypochlorite necessary to properly disinfect the water will depend primarily on the amount of pollution therein. A clear ground or filtered water, but slightly polluted, will require only about 0.2 part of available chlorine per million. Most surface waters will require about twice this amount. A water that is very turbid may require as high as 1.0 part per million to effect good bacteria reduction. There is always danger of tastes and odors in a water treated with hypochlorite, and while these qualities are not detrimental to health they are very unpleasant. A water high in organic matter will often give tastes which are not due to the chemical itself but to its effect on the organic matter.

There is only one way to properly control the amount of hypochlorite needed, and this is by bacteriological tests. Where a laboratory for making these tests is not available, however, the test proposed by G. Sims Woodhead* will be found a valuable aid. This test is as follows: Fill a quart bottle of clear white glass with the treated water and add to it a small crystal of potassium iodide, a few drops of weak acetic acid and a teaspoonful of starch solution. Shake well and hold bottle over a white paper. A blue tint indicates too much chlorine while a violet tint shows the correct amount. The starch solution is prepared by weighing out a small quantity of starch, mixing it to a paste with a little cold water and then adding this paste to two hundred times its weight of boiling water and allowing to boil a couple of minutes. A few drops of chloroform added to the bottle in which the solution is kept will preserve it. The writer knows of one plant treating about 30,000,000 gallons of water per day that uses the above test almost exclusively in determining the necessary amount of hypochlorite.

Place of Adding Chemicals.—There is more or less difference of opinion among authorities as to the best places to add the various chemicals. It has been the writer's experience that where soda ash is used it should be added before the sulphate of alumina a sufficient time to allow perfect mixing to take place. The two chemicals should never be added through the same pipe or at the same place, as is sometimes done at plants where the action of the chemicals is not understood. In a plant treating water with high turbidities, where the coagulation basin is so arranged that it can be divided, it will often be found advisable to divide the dose of sulphate of alumina, adding part of it where the water enters the second division after some of the turbidity has settled. The total amount of chemical needed will generally be lowered if the above plan is followed. Another method of operation which will sometimes reduce the amount of chemical needed can be used where the coagulation basin is large enough, this scheme being to overdose the water for a time with sulphate of alumina and then not add any for a while. It has been found to be very efficient and economical at Springfield, Mass., in connection with slow sand filters.

In a rapid sand filter plant there are three places where calcium hypochlorite can be added. These are in the raw water, the coagulated and settled water, and the filtered water. When added to the raw water, a large amount of chemical is required, but its regulation does not need to be overly accurate. It is undoubtedly less effective here than at the other two points, as in a well regulated plant the coagulation basins remove a considerable percentage of the bacteria without hypochlorite. When added to the settled water, less chemical is required, and its regulation does not need to be especially accurate, since the filters will remove most of the tastes and odors. Another advantage is that the load on the filters is lessened by adding at this point. In the writer's opinion, under most circumstances the best place to add the hypochlorite is to the filtered water. Much less chemical is required at this point than at the others, but the regulation must be more accurate in order to avoid underdosing, or overdosing with its resultant tastes and odors. The main advantage lies in the fact that the disinfecting action at this point is a factor of safety for all the previous operations.

Wherever the chemical be added, it is necessary that a period of contact be allowed for the disinfecting action to take place. This period varies with the character of the water. A clear, only slightly polluted, water requires only a small amount of chemical and a period of about an hour. A heavily polluted water requires a large amount of chemical and a contact period of only a few minutes.

*Surveyor, July 22, 1910.

WATER PURIFICATION AT KANSAS CITY.

Kansas City, Mo., obtains its water supply from the Missouri river, which is very high in turbidity during a considerable part of the year. In the report of the Water Department for 1913 it is stated that the turbidity during the twelve months reached a maximum of 7,000 parts per million during April, and that the lowest any day during the year was 10 parts per million, which occurred in January. The average turbidity for the month of April was 3,380 parts per million, and the lowest average for any one month was 156 parts in January. The average turbidity for the year was 1,915 parts per million, and as the total amount of water pumped from the river was 12,856 million gallons, over 90,000 tons of mud were contained in the water pumped. Lime and sulphate of alumina are used as precipitants, and the water is passed through sedimentation basins, with the result that the turbidity is reduced about 99.75 per cent, and that of the clarified water does not exceed 5 parts per million. During the last fiscal year the average amount of alum used was 1.22 grains per gallon, and 0.68 grain per gallon of lime was used on the average, although no lime was used during about three months out of twelve.

About 1½ per cent of the amount pumped, or 198 million gallons, was flushed out through the mud valves during the year, exclusive of water used in washing out the basins. From one-half to two-thirds of the sediment collected in the basins is flushed out through the sluice gates each day. The average sedimentation last year on a turbidity basis would equal 10 cubic yards to the million gallons, or about 350 cubic yards a day. The basins were washed out during the summer, the sediment being removed by playing a stream of water from a nozzle upon it and washing it out through the sluice gates, with the assistance of water flowing through ports in the partition wall. The photograph, page 423, shows the cleaning of basin No. 1 on June 18 of last year; water from one of the ports entering at the right hand side of the picture. This pile of sediment was 18 feet high at the maximum, sloping off to about 8 feet. The cost of removing the sediment shown in this photograph by this method was about ¾ of a cent per cubic yard.

The clarified water is also treated with hypochlorite (the plant was described in Municipal Journal, June 20, 1912), the amount used last year averaging 9.28 pounds per million gallons for the whole year. The highest cost of sedimentation, including labor and hypochlorite treatment, for any one month, was $3.66 per million gallons; while the lowest for any one month was $1.07. The average cost per million gallons for the year was $2.53.

ELECTRIC LIGHT AND POWER

Statistics of All Central Stations, Municipal and Commercial, in the United States—Number, Horsepower and Lamps in Service.

The Census Bureau has made public a preliminary report giving figures for the year ending December 31, 1912, for the central electric stations in continental United States. These statistics refer to stations only, and not to distributing companies or cities. Thus in many cases a number of cities are furnished with current from a single central station. One of the results of this is that, while the amount of power furnished by such plants increased about 84 per cent between 1907 and 1912, the number of stations increased only 11 per cent. In Illinois there was a consolidation by which a number of stations went out of service, the power being furnished by

Electric Light and Power Stations in the United States, December 31, 1912.

State.	No. of establishments—Commercial.	Mu-nicipal.	% Mu-nicipal.	Increase, municipal, 1907–1912.	Hydraulic horsepower. In service.	Increase, 1907 to 1912.	Estimated No. of lamps wired for service. Arc.—1907.	Arc.—1912.	All others,—1907.	All others,—1912.
Alabama	34	35	50.7	7	9,880	2,873	4,926	3,920	232,646	347,871
Arizona	16	....	....	....	9,300	8,550	754	686	72,028	136,400
Arkansas	56	18	24.3	5	3,040	2,740	1,669	1,102	142,525	243,728
California	97	15	13.4	1	432,062	223,618	19,691	24,890	3,068,214	6,793,200
Colorado	62	11	15.1	4	77,005	51,425	5,391	4,175	649,494	1,032,865
Connecticut	38	6	13.6	1	19,434	1,389	7,639	7,182	586,887	1,346,508
Delaware*	....	....	....	....	.....	.....	.....	.....	.....	.....
Florida	33	17	34.0	4	5,700	5,700	1,408	1,264	141,284	367,772
Georgia	42	84	66.7	25	51,957	15,622	3,173	2,651	180,337	410,068
Idaho	35	3	7.9	1	51,850	40,358	966	1,349	122,491	261,096
Illinois	170	99	36.8	—13	37,362	26,884	55,309	53,486	3,591,309	7,375,539
Indiana	130	71	35.3	3	23,915	4,309	22,165	17,328	1,330,660	2,375,448
Iowa	159	64	28.7	13	7,029	3,196	7,352	4,679	809,386	1,512,568
Kansas	94	82	46.6	50	8,820	159	5,685	7,904	472,751	898,204
Kentucky	73	16	18.0	2	.....	.....	6,884	7,814	483,796	849,220
Louisiana	27	23	46.0	2	.....	.....	8,587	7,267	377,225	584,015
Maine	75	4	5.0	0	69,938	30,172	3,187	1,863	443,192	481,748
Maryland*	43	13	23.2	—1	4,049	2,417	13,765	8,144	1,055,779	1,727,106
Massachusetts	87	30	25.6	6	24,480	7,699	33,869	28,238	2,655,303	4,687,246
Michigan	127	108	46.0	4	125,079	39,341	23,514	20,516	1,717,339	3,602,606
Minnesota	91	104	53.3	12	80,172	8,516	13,398	9,201	903,023	1,858,306
Mississippi	35	47	57.3	8	.....	.....	1,694	1,823	141,079	279,220
Missouri	125	65	34.2	7	1,902	—100	17,576	13,394	1,705,396	2,526,515
Montana	27	2	6.9	0	102,885	45,898	3,123	2,193	231,201	388,718
Nebraska	112	62	35.7	37	5,884	2,930	4,262	3,682	490,101	1,034,661
Nevada	7	1	12.5	1	12,540	6,280	327	321	63,939	45,443
New Hampshire	56	3	5.1	—1	56,937	31,533	3,510	1,900	301,734	397,491
New Jersey	56	8	12.5	1	1,569	—225	21,973	22,585	1,675,024	2,961,343
New Mexico	18	3	14.3	3	817	304	332	377	55,379	112,207
New York	272	49	15.3	2	512,406	206,456	97,529	94,324	7,017,061	12,884,911
North Carolina	46	48	51.1	12	49,951	39,989	1,936	1,928	144,256	571,384
North Dakota	33	9	21.4	1	.....	.....	1,163	866	119,233	219,452
Ohio	186	118	38.8	13	8,860	6,823	43,849	36,318	2,267,958	3,454,515
Oklahoma	67	63	48.5	49	2,135	2,135	3,451	3,659	219,537	592,315
Oregon	54	12	18.2	1	29,802	—72,250	3,927	1,285	372,844	382,196
Pennsylvania	239	45	15.8	0	132,293	101,430	66,777	64,673	3,897,662	6,257,665
Rhode Island	7	1	12.5	0	2,440	177	5,970	4,419	385,329	640,769
South Carolina	39	22	36.1	5	178,555	103,125	2,521	2,345	150,018	268,721
South Dakota	64	13	16.9	5	6,913	4,708	1,278	1,134	129,643	278,221
Tennessee	60	30	33.3	2	27,750	26,510	4,407	4,808	306,903	671,150
Texas	235	18	7.1	9	3,503	741	8,176	7,617	804,323	1,866,373
Utah	28	17	37.8	8	59,588	24,917	440	333	67,670	150,380
Vermont	48	13	21.3	0	35,272	6,800	1,866	1,080	306,245	404,151
Virginia	53	14	20.9	0	44,280	34,729	1,415	2,589	93,635	237,079
Washington	60	10	14.3	4	77,591	21,473	6,771	4,729	624,865	781,244
West Virginia	52	6	10.3	1	6,036	2,409	2,885	2,468	160,279	305,312
Wisconsin	173	78	31.1	14	68,766	49,765	8,697	10,394	781,681	1,791,732
Wyoming	18	2	10.0	2	1,334	569	517	492	59,674	112,228
Totals	3,659	1,562	29,9	310	2,471,081	1,121,994	555,704	505,395	41,608,338	76,506,910

*Delaware, District of Columbia and Maryland were combined under Maryland, no separate figures being available.

a few large central stations, which resulted in a reduction of the number of commercial stations by 101, or 37.3 per cent, and that of municipal stations by 11.6 per cent; although the number of lamps used more than doubled.

The figures give the number of commercial and of municipal stations, but beyond this make no distinction between the two, the figures being the totals of all stations in each state. They show that 29.9 of all stations were municipal; and that the number of municipal stations had increased during the previous five years by 310, or 24.8 per cent, and during the previous ten years by 91.7 per cent. During the same periods the commercial stations had increased 5.7 per cent and 30.4 per cent respectively. The number of municipal plants decreased in Illinois, Maryland and New Hampshire, while that of commercial plants decreased in New Jersey, Pennsylvania, Maine, Massachusetts, Indiana, Michigan, Illinois, Washington, California, Idaho, Montana and Nevada.

The hydro-electric horse power increased 83.2 per cent, but the water wheels only 18.2 per cent. The number of steam engines and steam turbines decreased 2.6 per cent, but the power so generated increased 83.7 per cent. The number of gas and oil engines increased 141.0 per cent, and the power derived from them 98.9 per cent. The power derived in each of these three ways in 1912 was: Steam, 65.7 per cent; water, 32.8 per cent; gas and oil, 1.5 per cent. The percentages of increase in power derived from steam, water, and oil and gas respectively were remarkably uniform—83.7, 83.2 and 98.9. The tendency to increase size of steam engines and water wheels is plainly indicated by these figures, which also show that in the case of oil and gas engines the change in size is just the reverse.

The kilowat rating of the stations averaged 983.5, and the output averaged 2,203,192 kwh., equivalent to 2,240 hours per year at full rated capacity, or a little over 6 hours a day. The number of arc lamps decreased during the five years 9 per cent, while the number of all other kinds increased 83.9 per cent. If we assume one arc equivalent to 25 lamps of the average intensity of all other kinds, the net increase is equivalent to 33,640,927 lamps, or 62.5 per cent. The tendency to substitute other kinds of lamps for arcs is very pronounced, a decrease in the number of arcs being found in 37 states out of the 48, and the increase in arcs in the other 11 states being very small, compared to that in the number of other kinds of lamps.

TYPHOID EPIDEMIC AT ROCKVILLE, MD.

Wilmington, Del., March 18, 1914.

Editor Municipal Journal, New York City:

Dear Sir:

The following may be of interest to the engineering profession since investigations and reports determine altogether the cause, effect and the remedy. There is always a latent interest held by the public at large and a demand by professional men, particularly engineers, in and for an investigation of an epidemic in a community. It is seldom, however, that the cause of an epidemic is quite so pronounced as at Rockville, Md.

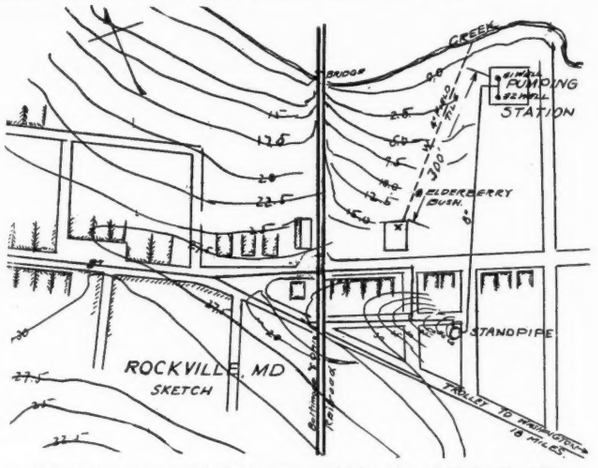
Prof. Earle B. Phelps for the United States Government at Washington, Robert B. Morse, chief engineer Maryland State Board of Health, a number of others and the writer were recently called upon by the authorities at Rockville to inquire into and alleviate a typhoid epidemic in which two per cent. of the entire population were stricken with the disease. There have been more than 20 cases, but to date there have been no deaths.

Rockville, a small town of 1,100 inhabitants, lies about 18 miles distant from Washington, D. C. It is built on the back bone of a ridge draining into three water sheds. Since 1897 the town has operated its own waterworks, obtaining a supply from two driven wells about 40 feet apart and some 225 feet deep, located in the valley in the direct line of the storm water run off from the town which takes approximately one-half the runoff.

The district surrounding the pumping station is sparsely built up, the town is unsewered and has few storm water drains. Kitchen and bath wastes are permitted to pass into the street and down the gutter. Cess-pools and open closets dot the hillside. A small stream passing near the pumping station serves as an outlet for floods, kitchen wastes, etc. The normal flow of creek does not exceed 4 cubic feet per minute.

The soil formation is clay (disintegrated rock), which is in turn underlaid with rock in layers, the seams of the rock containing clay, broken stone, etc., and in some instances forming open crevices and pockets.

The wells are 10 inches in diameter and are cased to rock. They are then reduced to 8 and 6 inches respectively. Rock was encountered when driving them at approximately 38 feet from the surface. When a depth of 220 feet was reached in well No. 1, the drill dropped several feet, indicating a hole or pocket formation at this point. No. 2 well is about the same depth and has the casing extending a little further into the rock.



SKETCH OF ROCKVILLE, SHOWING COURSE OF INFECTION.

The wells have been in service for nearly 17 years and the people have, until now, suffered no ill therefrom. However, after the installation of the supply, it was noticed from time to time during large storms that inundated the valley, that No. 1 well occasionally supplied turbid water. It was noticed further, that by pumping No. 1 well continuously for several hours, the water level was lowered very materially in well No. 2. Also that when No. 2 well was pumped the water was never turbid, and that the water level in well No. 1 was very little affected. Well No. 1 always seemed to have a surplus of water, whereas well No. 2 dropped fully 70 feet, in fact to such depth that the deep well pump would just draw all the well flowed.

This information should have indicated at once both to the town authorities and the public that No. 1 well was drawing from a surface supply; that the well was not tight, and that it should have been fixed or abandoned.

The sketch enclosed shows the approximate location of pumping station, creek, topography of ground and position of nearest dwellings. As indicated, the house marked (x) is situated nearest to the wells. The dotted line .....w shows where a tile drain had been laid from this last mentioned house to reach the creek. The tile used was perforated with holes and considerable waste and polluted water from closet and kitchen must have percolated into the surrounding soil. Growing close to the tile and about seventy-five yards from the wells was a group of elderberry bushes. Various solutions containing aniline dyes were placed in the small run and the wells pumped without results. Finally part of the field tile drain was dug up and the water backed up in the newly excavated trench and pumping continued. After placing the dye in the ditch it was noticed that no water containing dye reached the well until the dye was placed above the elderberry bushes and the water level had risen about to the top of the ditch at this point. About one hour after the water containing dye would flood the elderberry bush the dye would appear in well No. 1. When examined, this water showed gross pollution, whereas water in well No. 2 gave practically no indication of pollution. More than a week was consumed in locating the source of pollution. The first home in which the typhoid had occurred was the

one nearest the wells and the one which was polluting the well.

The water is now being sterilized with hypochlorite and use of well No. 1 discontinued, and it has been recommended to extend a 6-inch casing down well No. 2 to the 6-inch well barrel, using a piece of jute to make a temporary joint between pipe and well and to fill the well barrel between the new casing and the rock with cement, to pump and test well as originally tried when the contamination was established, and if it still shows contamination from an analysis after sterilizing and pumping, to drive a new well.

Yours truly,
HERBERT W. HATTON.

SAND FOR MORTAR AND CONCRETE

Tests of Thirty-Two Different Sands in an Effort to Determine Characteristics Which Secure Strong Mortar—Grain Surfaces Important.

Cement is used nowadays in construction work of all kinds—in concrete for lining reservoirs, building dams, concrete standpipes, pavement foundations and grouting, and in mortar used in all kinds of construction; and its characteristics have been widely and minutely studied, and much has been learned concerning the desirable and undesirable characteristics. In almost every case the cement is mixed with two or three times as much sand or other "fine aggregate," but, although attention has several times been drawn to the importance of the sand, there still is far too little attention paid to it. The cement, brick and other materials are carefully inspected and tested, while the specifications usually have little to say about the sand, except that it shall be "clean and sharp," and a casual glance at the sand pile is too often the only inspection given. As a result, inferior sands are used, giving mortar and concrete deficient in both durability and strength. In fact, some have claimed that the selection of the sand is much more important than that of the cement, and that the poorest cement on the market with a good sand will give a stronger and more reliable mortar than will the best cement on the market with an inferior sand.

Impressed with this view of the subject, C. C. Wiley, associate in civil engineering in the University of Illinois Engineering Experiment Station, has conducted a series of tests on thirty-two different sands found in the state of Illinois, and has recently published the result of these tests in a bulletin of the university. From this bulletin we take the following abstract. Space does not permit us to reproduce all of the illustrations and analyses, but we have taken eight of the best and eight of the poorest sands (graded according to the strength of the mortars) and present the data and conclusions concerning these.

Each sample was screened through a sieve having square openings of 0.2 inch to remove all particles larger than this, thoroughly dried with a steam coil and then stored in wooden lockers in a room maintained at about 70 degrees F. Shortly after the beginning of these tests, the size of 0.25 inch was adopted by engineering societies as the division line between fine and coarse aggregate, but as the experiments had already been begun it did not seem desirable to change from .20 to .25, especially since none of the sands contained an appreciable amount of material larger than .20. Each sand was tested for cleanness, graduation of size of grains, specific gravity, voids and weight. The approximate mineralogical composition and the comparative sharpness were determined, and finally tests for tensile strength were made.

The tensile tests were made on mortars composed of Portland cement and sand mixed 1 : 3 by weight. The same cement was used throughout, and the same amount of water—9 per cent (corresponding to 21 per cent of the cement), as required by the standard specifications for the uniform tests of cement with standard sand. This amount of water was sufficient for clean hard sand, but made a very dry mortar with dirty or soft sand; but the utmost care was taken in making the briquettes, and it is not believed that this dryness had any considerable effect on the results. Eighteen briquettes were made from each sample of sand, six being tested at the age of seven, six at twenty-eight and six at ninety days. Every precaution was taken to maintain uniform conditions throughout the mixing and molding; the briquettes were kept in moist air for twenty-four hours and then stored in water maintained at 70 degrees. The briquettes were tested in a Riehle automatic testing machine, the load being applied at the rate of 600 pounds per minute.

Cleanness was tested as follows: 1,000 grams of the dried sand was thoroughly agitated in about a gallon of water, the mixture allowed to settle for about one minute —sufficient time for the finest sand to settle—and the dirty water siphoned off with a quarter-inch rubber tube, care being taken that none of the sand was carried over with the water. This was repeated until the water remained clean, when the sand was re-dried and weighed and the loss in weight taken as the suspended matter.

Following this the sand was passed through sieves Nos. 5, 8, 10, 16, 20, 30, 40, 60, 74, 100, 150 and 200. In stating the sieve analyses, the suspended matter was included with the material passing the finest sieve. The specific gravity was determined by means of a Schumann specific gravity flask.

Special pains were taken to determine the voids in the sands, as large variations have been found in the voids as determined by different observers. After a number of trials, the following method was adopted: In a graduated cylinder, about 2 inches in diameter and 500 c.c. capacity, about 20 c.c. of sand was placed and compacted by striking the cylinder lightly on a pad composed of eight thicknesses of heavy cotton flannel. Twelve blows were given at the rate of about two per second with a fall of about one inch, care being taken that the blow was not hard enough to cause the sand to bounce and also that the cylinder struck squarely so that the sand was not thrown from side to side. Successive increments of sand were added in this way until the cylinder was filled. The difference between the weight of the empty cylinder and the cylinder full of sand gave the weight of 500 c.c. of dry compacted sand. The percentage of voids was computed from the equation $V = 100\ (S - W)/S$, in which V is the voids expressed in per cent of the total volume, W is the weight of the sand, and S is the product of the volume of the sand, its specific gravity and the weight of a unit volume of water; that is, S is the weight of an equal volume of sand containing no voids. The sands were examined by a magnifying glass having a power of about 5 diameters to determine the approximate mineralogical composition, the sharpness or irregularity in shape of the grains, and the roughness of the surfaces. The results could not be expressed exactly and were not tabulated, but were considered very important and are embodied in descriptions given of each sand.

In order that the characteristics of the several sands may be understood as thoroughly as possible, a table is given showing the tensile strength of the mortar made with each sand, the voids, the weight per cubic foot, the suspended matter and specific gravity. These have been arranged by us in the order of the tensile strength of the mortars at ninety days. In the same way we have arranged the illustrations in this order of strength, and have redrawn the diagrams representing the sieve analy-

ses of the samples so as to arrange the curves in the same order. The table, the photographs and these curves, supplemented by the description, give probably as good an idea of the sands tested as could be obtained without actual inspection.

SUMMARY OF DATA.

Rank, tensile strength.	Sample number.	Kind.	Tensile strength of 1:3 mortar at 90 days. Pounds per sq. in.	Tensile strength of 1:3 mortar at 90 days. Per cent. of that of standard sand mortar.	Voids, per cent.	Weight per cubic foot, pounds.	Suspended matter, per cent.	Specific gravity.
1	4	Limestone screenings	485	131.8	28.5	122.8	0.0	2.750
2	5	Bank	464	126.0	31.9	115.7	1.0	2.720
3	17	Bank	454	123.3	34.2	111.7	0.5	2.720
4	14	Bank	428	116.4	30.3	115.8	2.5	2.660
5	6	Bank	410	111.5	31.6	114.4	0.9	2.680
6	8	Bank	386	104.9	32.0	113.0	0.6	2.665
7	0	Ottawa 20 to 30 sieve	368	100.0	34.6	108.7	0.0	2.660
8	20	Bank	330	89.7	35.0	107.5	3.5	2.650
9	15	Bank	317	86.2	33.0	113.9	1.3	2.720
10	3	Lake	314	85.4	31.6	115.1	0.3	2.695
11	2	Lake	311	84.5	34.4	108.8	0.3	2.655
12	12	Bank	310	84.4	33.5	110.4	1.5	2.660
13	31	Bank	306	83.2	36.9	103.9	1.9	2.640
14	9	Bank	303	82.4	32.4	111.9	1.1	2.650
15	25	River	298	81.0	34.7	107.8	0.3	2.645
16	22	Lake	296	80.5	32.7	112.5	0.0	2.680
17	7	Bank	286	77.8	30.5	113.8	8.0	2.625
18	11	River	280	76.2	31.0	114.5	0.2	2.660
19	26	River	279	75.8	31.3	115.0	0.2	2.680
20*	10	River	269	73.2	31.5	112.5	0.3	2.630
20*	16	Sandstone screenings	269	73.2	33.0	112.2	0.0	2.705
22	30	Bank	262	71.2	32.9	111.9	2.7	2.665
23	23	Bank	259	70.4	35.2	108.3	1.2	2.665
24	21	River	258	70.2	30.1	115.8	Trace	2.650
25	19	River	257	69.8	32.3	112.0	0.0	2.650
26	13	Bank	241	65.5	35.8	106.3	0.2	2.655
27	24	Bank	211	57.4	39.4	99.7	4.0	2.635
28	1	Lake	205	55.7	36.2	105.8	0.3	2.655
29	29	Bank	194	52.7	35.5	106.7	3.2	2.650
30	32	River	178	48.4	34.6	108.7	0.6	2.660
31	28	River	170	46.2	36.5	104.4	2.4	2.635
32	18	Bank	159	43.3	39.7	100.2	18.3	2.660
33	27	Bank	140	38.1	37.9	101.0	4.4	2.605
		Neat cement	785	213.4	....	.....	...	.....

*Tied for 20th place.

The descriptions are as follows:

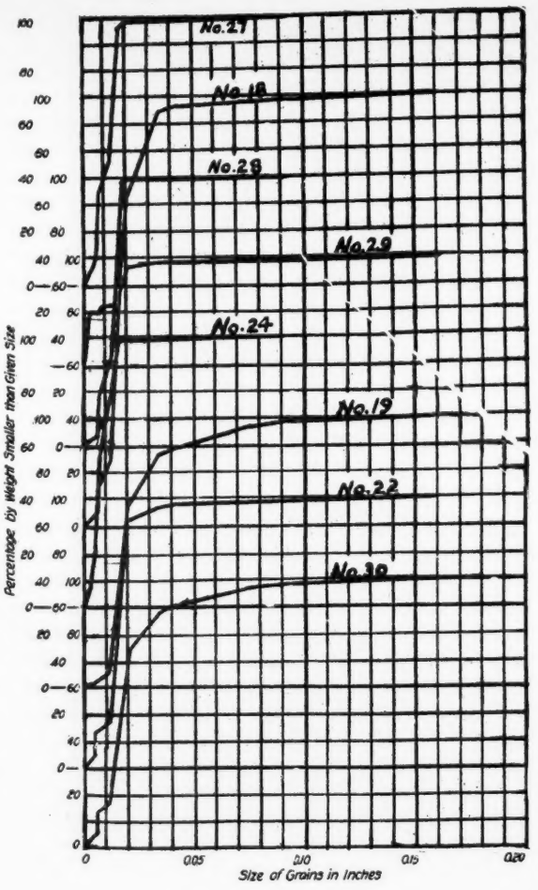
Sample No. 4.—Joliet limestone screenings (used in Chicago to a considerable extent). Stone very close and even grained and of a pale blue tint. In crushing, some of it passes into very fine dust, but there is no suspended matter. The sieve curve shows the sample to be almost uniformly graded. From this one sample it would appear that limestone screenings give a much stronger mortar than natural sand; but this sample is particularly well graded, has very little fine dust, and the stone itself is uniform and hard; hence it should be regarded as exceptional and not as typical.

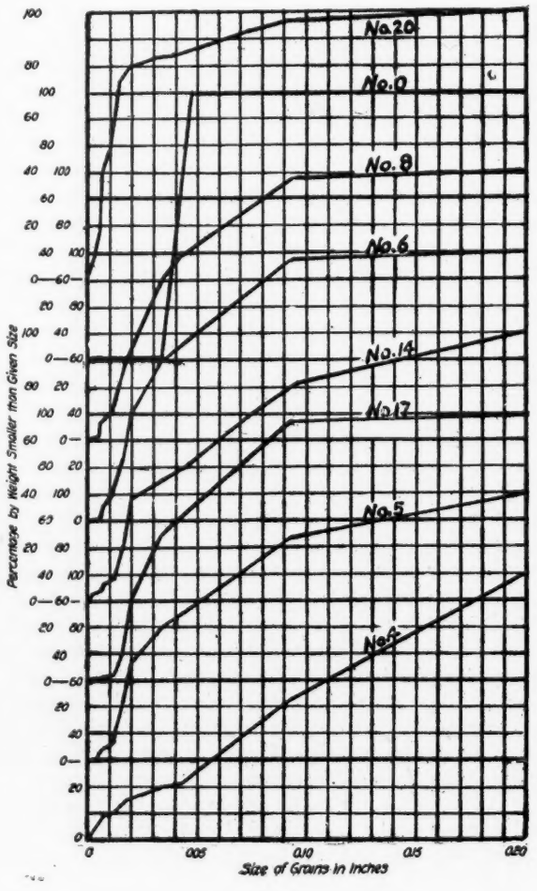
Sample No. 5.—Yellowish gray pit sand containing less quartz than the average Illinois sand. Other materials, principally limestone, flint and chert. One of the coarsest sands tested. Although reported as a "washed sand," it contained 1 per cent of suspended matter, a trifle more than Sample No. 6, which was "screened" sand from the same locality. Made the strongest mortar of the natural sands, being second only to the limestone screenings.

Sample No. 17.—Screened from bank gravel. Yellowish in color and composed almost entirely of quartz with some shale. Grains rounded, the suspended matter, of which there is 0.5 per cent, adhering to them but easily removed by wetting, and therefore not affecting the tensile strength of the mortar. Sieve analysis indicates that, while not well graded, this sand is comparatively coarse, and the tensile strength is high, since the grains are all hard and strong.

Sample No. 14.—Screened from bank gravel. Brownish in color. Contains considerable flint, granite, limestone and shale, with some softer rocks containing iron oxide. The coarsest sample of natural sand tested, and might therefore be expected to yield a mortar next in strength to the limestone screenings, and probably would but that many of the grains are so soft that they were ruptured in the tensile tests, showing that they were weaker than the adherence of the cement to them.

Sample No. 6.—Screened pit sand. Grayish in color. Contains a small proportion of flint, granite and chert, the majority of the material being quartz. Somewhat excep-





SIEVE ANALYSIS CURVES OF SANDS.

The best 8 sands and 8 of the poorest are arranged in the order of strength of mortar made from them, the best at the bottom. Note that in general the less the percentage of 0.02-inch sand, the stronger the mortar.

tional, in that the fine grains are the more angular, the large grains being well rounded.

Sample No. 8.—Bank sand from deposits which are very uniform in quality. Light gray in color. Contains considerable chert with some limestone and flint. Fairly well graded.

Sample No. 0.—Ottawa Standard Sand of pure quartz from the St. Peter formation near Ottawa, Ill. Grains spherical, almost transparent, with dull surfaces, and nearly all of the same size, since the sand is screened to pass a No. 20 sieve and be retained on a No. 30.

Sample No. 20.—Bank sand, yellow in color. Contains some granite, flint, shale and chert. Grains rounded and coated to a considerable extent with clay. Not well graded, there being a large amount of fine material and a fair proportion of coarse material, but a marked deficiency in grains of intermediate size. When wet, it behaves considerably like quicksand, and on drying shows a decided tendency to form lumps.

Sample No. 30.—Pit sand. Yellowish in color. Contains some shale, flint and granite. Grains well rounded and quite fine.

Sample No. 23.—Bank sand, very fine, with only an occasional large grain. Grains all well rounded. Composed principally of quartz, with some limestone and chert. Color, pale yellow. Too fine to be desirable for ordinary purposes, but if the large grains were screened out it would form an excellent grout sand.

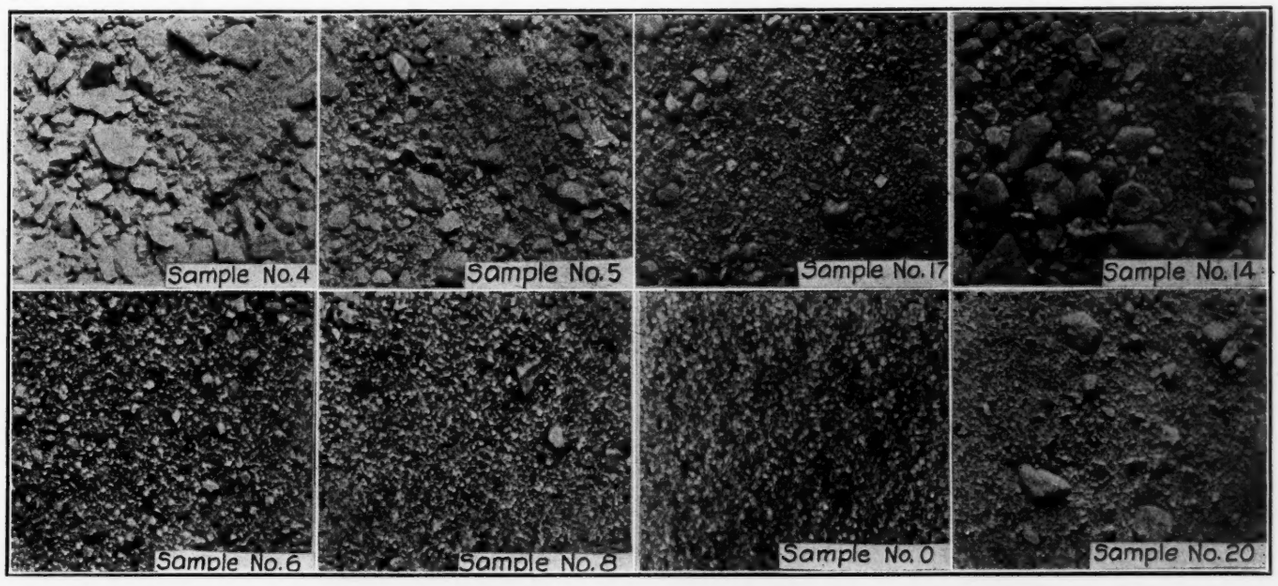
Sample No. 19.—Bar sand from the Mississippi river. Gray in color. Composed principally of quartz, with some flint, limestone and granite. A decided deficiency of fine material, as it contains no suspended matter, and only 0.2 per cent passes the No. 100 sieve. The tensile strength is therefore less than would be expected from the other characteristics of the sand, and it would probably improve the mortar to add some fine material to it.

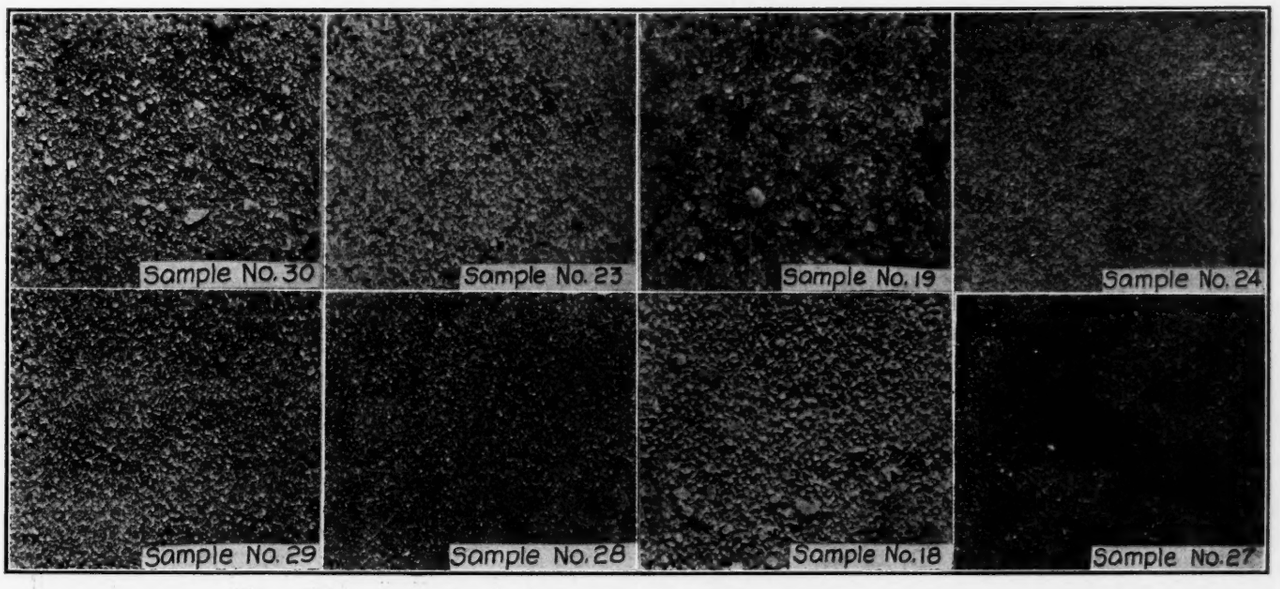
Sample No. 24.—Bank sand. Light yellow in color. Grains well rounded. Principal components, quartz, limestone and shale. The finest in the series, all passing the No. 16 sieve and 99.5 per cent the No. 40 sieve. Contains 4 per cent of suspended matter. Shows a decided tendency to form lumps on drying. Like Sample No. 23, it is too fine for ordinary purposes, but would be quite satisfactory as a grout sand. Mortar made of it is reported to work best when the portion of cement is small, and considerable quantities have been used in this way, but have not proved satisfactory.

Sample No. 29.—Bank sand. Gray in color. Composed almost entirely of quartz. Grains well graded and very fine.

Sample No. 28.—Bar sand from the Wabash river. Yellowish in color. Contains some flint, granite and cinders. The finest and also the dirtiest of the river sands. Grains well rounded.

Sample No. 18.—Presents some rather unusual characteristics. Pit sand. Color, reddish yellow, due to the





PHOTOGRAPHS OF SANDS USED IN TESTS.

The best 8 sands are shown at the top and 8 of the poorest at the bottom, all in the order of the strength of the mortars made from them.

large amount of clay present. Grains quite uniform in size and rounded in shape. The greater part of the material lies between the No. 20 and No. 60 sieves, and there is a very large amount of fine material including the suspended matter. The suspended matter, amounting to 18.3 per cent by weight of the total sand, consists almost entirely of clay which adheres very tightly to the sand grains, each grain being entirely coated to such an extent that it is impossible to recognize the materials of which the grains are formed without first washing the sand. On wetting, this clay becomes gummy, making it impossible to wash it from the sand without resorting to a thorough scrubbing, and hence it is doubtful if this sand can be economically washed on a commercial scale. After a thorough washing, there is quite a marked change in appearance, the color being gray, the grains quite angular, and the sharpest in the series, with the exception of No. 21. Composition about half quartz, the other materials being limestone and granite, with large proportions of shale and other soft rocks. The sand as a whole is of very poor quality, due to the large amount of soft materials, poor grading, and abnormal amount of suspended matter and the way in which it coats the sand grains.

Sample No. 27.—Bank sand. Reddish yellow in color, due to the 4.4 per cent of reddish clay which forms a coating around the grains. Contains some granite, limestone, flint and considerable amounts of soft materials, and shows a tendency to form lumps. Next in fineness to No. 24. Its low strength is due both to the coating of clay on the sand grains and also to the fineness and softness of the grains themselves. Has been used a great deal for pavement foundations, common brick work, etc., and given fairly satisfactory service; but the tensile strength is so low that it would be advisable, and perhaps more economical, to abandon the use of it entirely.

(To be continued.)

PASADENA MUNICIPAL LIGHT PLANT.

General Manager Koiner, of the Pasadena, Cal., municipal light plant, has submitted to the City Board of Commissioners, through Commissioner Salisbury, a utility statement showing the condition of the city's plant. Although the municipal light plant, which usually makes monthly, semi-annual and yearly reports, is not required to prepare an annual utility report such as the one submitted by the Southern California Edison Company, which makes no report other than the annual utility one, Mr. Koiner says he feels it incumbent upon him to meet every requirement expected of the private corporation, hence the figures just submitted.

In his statement Mr. Koiner shows that while interest, depreciation and surplus accounts are not closed by the city plant until the end of the fiscal year, June 30, 1914, he has apportioned them so as to include these items in his statement to the city commissioners.

The report shows that the net operating revenues, after paying all operating expenses and charging for depreciation, amounted to $51,649.93, which would amount to 8.95 per cent on depreciated values. If it were desired to charge up taxes and rentals, the earnings would amount to 7.91 per cent.

All money over and above operating expenses is being used for extensions and additions, Mr. Koiner states, so that while the city plant does not have the actual cash it has its equivalent in property that is being used for the service of the city.

The plant showed a total income for the year of $161,182.20, of which $150,547.68 was earned within the city limits and $10,634.52 beyond the city's confines. Domestic light users paid the city $56,486.87; commercial light users paid $22,899.23; municipal light paid $47,706.16, while commercial power users paid $29,560.58, and domestic power users paid $4,534.36.

Operating expenses were $84,068.22. Interest paid amounted to $21,351. Construction work for the year cost $82,664.85, all of this work being paid for out of the plant's earnings.

The total cost of the plant has been $656,807.23, the depreciation upon which is $24,529.33, leaving the net value of the plant at $632,227.90; against which there are only $281,875 in bonds outstanding at the present time.

At the time of inaugurating the lighting plant, a base rate of 12½ cents was charged for the first 666 kwh. The base rate was then reduced to 8 cents, while other cities in Southern California were paying 12½ cents. Ultimately the base rate in other cities dropped to 10 cents and finally to 8 cents. The Pasadenans claim, however, that this rate reduction was due in large measure to the example set by their municipal plant. A recent decrease in the base rate from 8 to 5 cents shows that the people in Pasadena are paying 37½ per cent less for their current as compared with consumers supplied by a competing company.

The city claims a saving of not less than $408,000 from October 1, 1908, to June 30, 1912, as the result of establishing its light plant. If to this be added the saving for the year ending June 30, 1913, coming from the low rate as compared with light rates prevailing in other cities for the same period, the sum of not less than $149,083.96 must be added, making a grand total of $557,083.96.

The cost of street lighting has also been greatly lowered as compared with rates formerly paid to a private concern. Street arc lamps now cost 23 per cent less, incandescent street lighting 40 per cent less, and ornamental cluster lighting at least 20 per cent less. At the time the city began using electric current for street lighting purposes, it had lamps aggregating 50,000 candle power for which it paid $15,808.40 per year. At present Pasadena has the benefit of 267,000 candle power for street lighting, or 4 1/3 times more light, for which the city is charged $45,711.93. In addition to this saving, it is claimed that the service rendered to the city for street illumination from the municipal plant is far superior to any service previously received.

The population of Pasadena is placed at 35,000.

PORT ARTHUR'S PUBLIC UTILITIES.

Port Arthur, Ont., has for three years been operating its public utilities under what is practically a city manager, but is called a commissioner of utilities, the commissioner being J. J. Hackney, a railroad expert. The city owns and operates all its public utilities—street railway, electric light, electric power, telephone and water. The commissioner of utilities has charge of all these and also of the fire department, city purchasing, and general financial control; in fact, of practically everything except the police.

During the three years of this system of management, the rates in the electric light department have been reduced four different times, but the department last year showed a surplus of about $65,000 over and above all expenses, including interest, depreciation and sinking fund. The electric lighting rates are as follows: For residence—4 cents per hundred square feet of area lighted, plus 2½ cents per k.w.h., with 10 per cent discount for prompt payment; commercial—6 cents for the first thirty hours monthly use of installed capacity, plus 2½ cents per k.w.h. for all in excess, with 10 per cent discount for prompt payment. There are no rates by meter. The number of light consumers was 3,325.

Power is furnished to 55 consumers at the following rates: Unrestricted, $25 per horsepower per year for 24 hours a day; metered power, $1 per month per horsepower demand load, plus an energy charge of 2 cents per k.w.h. for the first 50 hours monthly use of the maximum demand; 1.3 cents per k.w.h. for the second 50 hours' use of maximum demand, and 0.15 cents for all in excess of this, with 10 per cent discount for prompt

payment. The power department also shows a large surplus for last year.

The telephone department has 2,700 customers, and just about pays expenses of all kinds. The telephone rates are $15 per annum for residence and $30 for commercial.

The street railway sells regular tickets, good at any time, at six for a quarter. Workmen's tickets are sold at eight for 25 cents, and children's tickets at ten for 25 cents.

REMOVING IRON AND MANGANESE FROM WATER

Results of Experiments Conducted on Three Different Waters—Too Much Aeration Possible

In a paper which he read recently before the New England Water Works Association, Robert Spurr Weston, of Boston, Mass., described investigations which he had made in the removal of iron and manganese from waters for public supplies. A brief description of some experiments and his conclusions from them are given herewith.

The fact is now known that iron exists in water as an iron hydrate, which is soluble but which can be precipitated by aeration and the insoluble matter removed by filtration. Some waters, however, contain interfering substances which prevent the precipitation of the iron, holding it in the semi-soluble or colloidal form and making its removal by filtration difficult. Interference with the removal of the precipitated iron is caused by carbon dioxide, organic matter and manganese.

Not only carbonic acid but all acids interfere with the precipitation of ferric hydrate, and it is necessary to eliminate the carbon dioxide as much as practicable before treating the water. With waters of peculiar organic composition, especially those from beneath alluvial deposits or marshy areas, aeration can be carried so far as to make it impossible to coagulate the oxidized iron before filtration.

Not all organic matter interferes with the precipitation of iron. For example, that from deep wells in geologically old deposits assists in the removal of iron and the iron in turn assists in the precipitation of the organic matter. The writer is of the impression that the fresher and newer the organic matter, the more it interferes with deferrization. Extracts of freshly fallen leaves and grasses and all gelatinous bodies like glue interfere with the process. The writer believes that matter rich in humic acid interferes with the coagulation of iron when the water is excessively aerated.

It has been found at Superior, Wis., by Lounsbury, and at Reading, Mass., that when the water was already high in oxygen better results were obtained without the aerator than with it, because the presence of carbon dioxide, which would be reduced from 12 to 4 parts per million by passing the water through the aerator, was necessary to prevent the soluble organic matter from interfering with the deferrization process, and he concludes that aeration can be too thorough. Mr. Weston learned at Reading that the iron could be induced to coagulate and the interference of organic matter avoided by contact with broken stone; not by trickling the water over it, but by passing the water through submerged stones or coarse coke. The same effect could be secured by a very long storage, but at a prohibitive cost. The submergence of the filtering material prevents the loss of CO_2, and the contact brings about the coagulation of the iron, notwithstanding the presence of a small amount of this interfering gas. Plants could be designed to remove part of the CO_2 by aeration, and then bring about a precipitation of the iron by contact with the submerged material.

Manganese has rarely if ever been reported in the results of analyses published by boards of health or water commissioners, but recently it has been given some attention. Chemically it is closely related to iron, but reacts and precipitates more slowly, and it possesses the power of preventing the removal of the last traces of iron unless it be itself removed at the same time. For complete demanganization it is therefore necessary to increase the contact treatment beyond that necessary for deferrization alone.

During 1913 the writer conducted three experiments for the Cohasset Water Company and the towns of Middleboro and Brookline, Mass., which waters contained .23, .75 and .26 parts per million respectively of manganese. The most difficult of these to treat was the Cohasset water, on account of the high amounts of organic matter and carbon dioxide, the latter amounting to 49.82 parts. Iron was present to the extent of .73 parts.

Mr. Weston described a number of experiments conducted with a view to determining the most effective method of removing the iron from this water, the first series being conducted by the Norwood Engineering Company with the assistance of A. L. Gammage of his office. A sprinkler for securing aeration, barrels as subsiding basins, a wooden tank 3 feet square filled 5 feet deep with coarse broken stone, and a small Wilson mechanical filter comprised the apparatus used in the experiments. Based upon these, plans for a deferrization plant were prepared by the Norwood Engineering Company, and a contract has been let for their construction. The plant consists of an aerator and trickler supported above a small subsiding basin, the whole discharging into three mechanical filters of standard pattern, with a filtered water basin beneath. The trickler is designed to operate at a rate of 75 million gallons per acre per day, and is to be filled with coarse coke 10 feet deep. The piping is arranged so that the trickler may be operated submerged, partly submerged or non-submerged. At certain times of the year it will be impossible to aerate the water very much and still remove the color and iron; nevertheless the period of contact may not be reduced. It is probable that the coke will have to be operated partly submerged.

The difficulty in the Brookline water is the relatively small amout of iron to be precipitated. (It is much easier, other things being equal, to precipitate five parts of iron per million than one.) Four different methods of treatment were experimented with by Mr. Weston and the superintendent of the plant, F. F. Forbes. These were put into operation early in August and continued as long as weather permitted. Over 200 samples of water were analyzed to determine the efficiencies of the four systems. Each system tested consisted of aeration, coagulation and sand filtration; the variations being in the size of the coagulation basin and in the introduction between the aeration and coagulation of a coke trickler in three out of the four systems, depths of coke trickler of 2, 5 and 10 feet being tried.

The efficiency of the preliminary treatment in these tests was dependent largely upon the amount of dissolved oxygen added to the water and the amount of carbon dioxide removed. All of the analyses show that the removal of manganese and turbidity is roughly proportionate to the removal of iron, which is the real index of the efficiency of the plant. A satisfactory plant in practice should, Mr. Weston states, reduce the iron to below 0.2 parts per million, and the carbon dioxide to at least 5 parts per million.

The cost of constructing each of these four systems.

based on a capacity of eight million gallons daily, was estimated to be $284,900, $152,900, $157,850 and $162,800, respectively. The second is seen to be the cheapest, but did not in the experiments meet the standard just stated. With number 2 eliminated, number 3 would be the cheapest satisfactory system, with number 4 only a little more expensive. Number 3 consisted of the aerator, a coke trickler having a depth of 5 feet of coarse coke, a coagulating basin having a capacity equivalent to one hour's flow, and a sand filter operating at a rate of ten million gallons per acre per day and containing 30 inches of sand having an effective size of .41 mm. The sand was supported on a layer of graded gravel one foot deep. Number 2 was exactly the same, except that the coke was only 2 feet deep; while number 4 differed from number 3 only in having 10 feet of coke instead of 5.

Experiments with the Middleboro water were made with a spray aerator discharging upon a trickler, which consisted of a barrel filled with 1 to 1½-inch broken stone 2½ feet deep; followed by a filter containing 26 inches of sand having an effective size of .285 mm. and a uniformity coefficient of 2.3, which was operated at a rate of ten million gallons per acre per day. Considerable trouble was found with the clogging of the filter, but this was greatly reduced by increasing the depth of the trickler to 6.7 feet. Analyses of the stone in the trickler at the end of the experiment showed that the removal of the iron began at the top of the trickler, and was nearly complete except for the final straining before the filter was reached; but the demanganization process began in the lower part of the trickler and most of the manganese passed through the subsiding basin and was removed by the filters.

Based upon these experiments, a plant was designed for Middleboro and was built during the summer of 1913. The details of the design and construction were worked out and supervised by G. A. Sampson, with T. F. Dorsey as resident engineer. The contractor for the main structures was the Briggs Engineering & Construction Company, of Providence. A De Laval steam turbine driven centrifugal pump raises water from a pump well to the top of a pile of coke—a so-called trickler—through a number of sprinkling nozzles. The trickler consists of a concrete tank, 30 feet in diameter, outside measurement, and 28.3 feet inside, containing 10 feet in depth of coarse coke supported on a concrete grill above the true bottom. Water discharged on top of the trickler and passing through it falls through the grill into the bottom, and from this flows through a pipe into a settling basin, built of concrete and having a capacity of 40,000 gallons, which is covered with a concrete roof and this again with earth to prevent freezing. From the settling basin the water flows into the two compartments of a filter which has a total area of one-tenth of an acre. These filters are concrete basins with groined roofs, covered with earth, to prevent freezing, and filled with 3 feet of medium size sand resting upon 12 inches of graded gravel, which in turn covers tile underdrains. From these filters the water flows into a regulator house in which are located all of the valves and gauges for operating and regulating the filters. From the regulator house the final effluent flows into a filtered water basin which holds 42,000 gallons, this being large enough to enable the pumps and filters to operate regularly and at the same time provide for the irregularities of consumption. The present consumption is about 335,000 gallons per day, and the maximum for any one day so far has been 873,000 gallons.

Of these various parts the aerator and trickler alone are worthy of special comment. The aerator consists of a system of piping connecting the discharge from the low lift pump with thirty-seven 2-inch upright nipples. On each nipple is screwed a cap drilled with twenty-four 3/16-inch holes and pressed into a convex surface so that the axes of the holes are radial. The sprays discharge upward, and the water falls on the surface of the coke trickler. The grill which supports the coke consists of 2x6-inch reinforced concrete beams, spaced 2 inches apart and supported upon a bracket 6 inches wide running around the inside of the wall of the tank and also upon four 6-inch crosswalls which rest on the floor of the tank. The floor slopes to a channel leading to the outlet, which is an 18-inch cast iron pipe. A shear grate provides for the closing of this outlet, permitting the trickler to be filled, when the valve may be opened quickly and the accumulation of coke flushed out through the subsiding basin and into the drain. It is not expected that flushing will be required oftener than once a year.

The complete plant cost about $18,000, including engineering.

The filters were started September 26, 1913, and prior to January 12, 1914, had been raked twice and scraped once. The yield for this first run was 40 million gallons, or 400 million gallons per acre. The filters have been in operation so short a time that the effluent varies in quality considerably, particularly just before and after scraping or raking the filter. The average results obtained were as follows:

Average Results of Operation, Middleboro.

First Run, September 26, 1913, to January 12, 1914.

(Parts per Million.)

Determination.	Well.	Settling Basin Effluent.	Filter Effluent.
Color	48	22	5
Turbidity	5	3	1
Iron	1.62	0.46	0.17
Manganese	0.67	0.36	0.27
Hardness*	27.3	....	23.4
Oxygen consumed	1.79	1.53	1.05
Carbon Dioxide*	41	4.2	4.6
Dissolved Oxygen*	2.95	10.20	9.55

The manganese was reduced still further later on, on January 22 being reduced from .85 parts per million in the well water to .10 in the filter effluent. After scraping, the iron increased to .35 part in the filter effluent, but an analysis by the State Board of Health on February 4 showed it to be .18—all that could be desired.

Should the organic matter in the well water increase, the trickler may be arranged to operate partly submerged. The removal of the carbon dioxide and the practical saturation of the water with oxygen are worthy of notice; also the great share of the work borne by the trickler, which thereby greatly lessens the cost of filter operation.

All things being equal, it is well to remove the carbon dioxide as completely as practicable in order to prevent subsequent corrosive action of the water upon the distribution piping; consequently, aeration and contact in a trickler should be employed as far as possible, and submerged contact when this method fails. Naturally the choice of methods depends upon the character of the untreated water, and one of the aims of this paper is to make it plain not only that different supplies vary, but that even the water from the same well may require variations in treatment at different times.

Regarding the choice of filter, it may be stated that properly treated water can be filtered through either slow or rapid filters with good success. The high rates possible with a slow sand filter and the infrequency of cleaning when the pre-treatment is adequate, usually make it more economical than the mechanical filter; furthermore, when manganese is present it undoubtedly gives more uniform results.

*One determination.

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F. E. PUFFER, Assistant Editor

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CHANGE OF ADDRESS
Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for.
Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

MARCH 26, 1914.

CONTENTS

Operation of Small Sand Filters. (Illustrated). By H. P. Letton 423
Water Purification at Kansas City 427
Electric Light and Power 427
Typhoid Epidemic at Rockville, Md. (Illustrated) 428
Sand for Mortar and Concrete. (Illustrated) 429
Pasadena Municipal Light Plant 432
Port Arthur's Public Utilities 432
Removing Iron and Manganese from Water 433
Operating Water Purification Plants 435
Municipal Bonds 435
Selecting Sand for Mortar 435
Duplicate Water Mains 435
Mending a Main and Valve. By Daniel J. Higgins 436
Municipal News. (Illustrated) 437
Legal News—Notes of Recent Decisions 443
News of the Societies 445
New Appliances. (Illustrated) 447
Industrial News 450
Personals 451
Contract News 452

Operating Water Purification Plants.

The series of articles giving suggestions for operating sewage treatment plants, which began in a January issue, has been welcomed by many engineers and managers of such works, thus confirming our own opinion that something of this kind is and has for some time been needed, especially by those operating the smaller plants. There seems to us to be a similar demand for articles dealing with the operation of water purification plants, the importance of which subject was referred to in a paper by H. P. Letton which was printed in our issue of January 22, and to which we would again call attention. We are glad to announce that Mr. Letton will write for Municipal Journal a series of papers dealing with the operation of water purification plants, in which he will offer suggestions to the managers of rapid sand filtration plants, especially the comparatively small ones which are not under the immediate direction of experts. The first of these articles appears in this issue.

Municipal Bonds.

The authority on bond selling and buying which we have previously quoted, The Bond Buyer, states in its issue of March 21 that "there seem to be no signs of a halt in the steady decline of municipal bond prices. The demand continues unabated, and dealers are apparently confident that the outlook for the next six months, at least, warrants the payment of the present high prices. A rough estimate places the increase in the market value of a fairly large city issue carrying 4½ per cent for thirty years, at from three and a half to four and a half points, or from a 4.50 to a 4.15 per cent basis." Within the last two weeks Detroit has sold over four million dollars' worth of bonds on a 4.18 basis; Louisville, Ky., a million dollars' worth on a 4.23 basis; Elmira, N. Y., sixty-five thousand dollars' worth on a 4.26 basis; Grand Rapids, Mich., $106,500 on a 4.29 basis; while a number of other cities did nearly as well.

As we have previously stated, there would seem to be good reason for believing that municipal bonds will continue to find favor in the eyes of investors, on account of the clause of the Federal Income Tax law, "The interest upon obligations of a state or any political subdivision thereof is exempt from the Federal Income Tax, and no Certificate of Ownership is required in collecting said interest."

Selecting Sand for Mortar.

There appear to be few, either engineers and other "practical" men or laboratory investigators, who know why one sand makes a good strong mortar and another does not. The idea that any dirt at all is injurious has been disproved, but how much and what kind is permissible is still in question. All would probably rule out loam or any vegetable matter, and some would permit clay only; but others have found clay to weaken the mortar. The paper abstracted at length in this issue is an important contribution to the study of this most important subject.

One of the interesting conclusions drawn by the author is that, while uniform grading so as to secure a dense mix is very important, a rather rough and clean surface of the sand grain is even more so. A small amount of clay greatly weakens the mortar if its nature is such that it adheres tightly to the sand grains in a thin film which ordinary handling and mixing with water do not remove; and cement adheres better to well worn grains than to clean fractures or crystalline surfaces. These and other features of the paper deserve careful study by those interested in concrete and mortar.

Duplicate Water Mains.

A few weeks ago we expressed our belief that it is very desirable to have in every distribution system a duplication of the important mains of the system, in order that no one break in any part of the plant could in any way curtail the water supply to any serious extent. In an article on another page we describe an interesting instance in which a 20-inch force main was out of service for thirty-six hours before it could be repaired, the break unfortunately happening at the same time that, for another reason, the distributing reservoir was practically empty. As there was no adequate duplicate force main, the city was in an uncomfortable and even perilous condition for a day and a half.

Ordinarily there could be no question that common prudence would demand the laying of a duplicate main, but the peculiar situation of the city in question suggests an alternative, this being the connecting of the distribution system with the system of an immediately adjoining city, which would serve as a protection against not only a break in a main feeder from the pump or reservoir, but also any deficiency in the supply itself, assuming that the city connected with it was not utilizing the same source of supply.

But in some ways this connection between cities, which allows each one to assist the other in case of emergency, can hardly be considered in most cases as an adequate substitute for the duplicate force main or main supply

line, for it assumes either that the distribution system (and the pumping and purification plants, where there are any) of each city is adequate for the supply of both, or else that during the emergency when this connection between systems would be in use, one or both of the cities would be on short allowance of water. If each city, however, were provided with the duplicate mains suggested, there would be none of the inconvenience or fire hazard due to limited supply; and, moreover, the city would not be called upon to add to its expenditures by paying for the water borrowed during this time of necessity. It seems to us, therefore, that while the interconnection of systems where cities are sufficiently close to permit of it is generally desirable, such connection is not a sufficient excuse for neglecting the precaution of duplication of those pipe lines which are vital to the operation of the distribution system.

MENDING A MAIN AND VALVE

Breaking of Force Main of English-Made Pipe and Lack of Adequate Duplicate Main Cause Critical Condition—Rapid Repairing.

By DANIEL J. HIGGINS*

The water works system of Waltham, Mass., contains a 6,000,000 gallon low pressure reservoir and a 2,000,000 gallon high pressure reservoir. In the outlet chamber gate house of our low pressure reservoir the screens carried away some weeks ago and in order to make repairs we turned the water through the city and in three days had so far emptied the reservoir that we could work in this gate house. After getting down to the bottom we found the sluice gate was cracked and rusted and the turning rod corroded away to almost nothing. This has been in use since 1872 with practically no repairs. I immediately set about putting in bronze ways for the screens and a new 20-inch gate valve to take the place of the sluice gate. Meantime we practically had no reserve supply—enough to last a few hours only.

This reservoir is supplied from No. 1 pumping station through two force mains, an old 12-inch and a comparatively new 20-inch. While the reservoir was practically empty, as stated, on Saturday, February 21, at 11 o'clock in the morning, the 20-inch force main was discovered broken. After locating the break and the valves on either end of it, one was closed without difficulty, but after about twelve turns, the second valve was found to be broken. Attempts were made on two by-pass valves, a 12-inch and a 6-inch, which were closed, but this did not stop the leak, and it was finally stopped by closing our 24-inch supply line.

We started to dig away the frozen ground around the 20-inch valve to find out the trouble and at each operation it went from bad to worse. First, we found the bracket on the bevel gear attachment broken. After removing it and taking out the stem, we found that it was bent in the form of a U. After removing the bonnet we were an hour trying to pry out the plug, and this we found to be the cause of all the trouble. The face of the plug on the westerly side pointed toward our No. 2 station. The broken valve was caused either by water hammer, careless closing at some time or a poor piece of metal in the casting of the plug. There is a curved line back about four inches from the circumference continuously and also six radial lines. This indicates that the plug on the face must have had severe pressure at some time. The brass face on the valve was also cracked in three places and broken in one. The opposite side of the plug is apparently without damage.

*Superintendent Water Department, Waltham, Mass.

The break in the pipe practically put our 20-inch supply line out of commission and it was useless to try to work the 12-inch main. We made several efforts to borrow a 20-inch gate valve from one of our neighboring cities and also from the Metropolitan Water Works. The city of Boston had a 20-inch gate, but it was vertical and we could not use it in the horizontal position required for our repair. In the meantime, we had been getting the necessary pipe, etc., to the job and made the pipe repairs. We put a large plug on the inside of the bonnet of the valve where the stem went into it and left the valve dead. We were then able to pump our supply into the new reservoir in about 36 hours from the time the break occurred.

Weather conditions at the time of the break were unusually severe. It was six degrees below zero all the time we were making repairs, and we had to contend with about 16 inches of snow also.

The break has been repaired and we are now waiting the arrival of a new 20-inch valve to complete our repairs.

The Associated Factory Mutual Fire Insurance Company, through Inspectors Burnham and Heuter, who had just returned from the Montreal water break, went over this break and conditions and found, according to their report, that "The city has done the work with the greatest possible speed. In order to make these repairs finally complete, it will be necessary to shut down this part of the system again. It is expected that with the standpipe and reserve reservoir full, it will be possible to accomplish this without depriving the city of its supply of water, although the pumps may not be capable of being operated in the interval."

The broken pipe was a length of English 20-inch pipe bought and laid by this department in 1907. This last break is the third in a section of 2,400 feet of English 20-inch force main. We have about 4,000 feet of American pipe on this same force main which has given no trouble whatever. On making an examination of the break, I discovered a 12-foot length broken from end to end from a quarter to one-half an inch. After breaking down the pipe we found on the inside, near the bell end, was a place as large as a man's hand in the form of a blister. After removing the blister, the iron showed what is called "cold shut" in foundry terms. The iron at this point was about one-half an inch thick. The shell thickness was about three-quarters of an inch as compared with our N. E. W. W. Association "Class E" standard specifications of 85-100 of an inch.

We had the pipe analysis made and the following is quoted from the chemist who made the tests: Silicon 2.72 per cent; sulphur, .072 per cent; manganese, .43 per cent; phosphorus, 1.23 per cent; combined carbon, .37 per cent; graphitic carbon, 2.95 per cent. It is evident that the silicon and phosphorus are so high as to show conclusively that the pipe is very brittle and not at all to be trusted. In way of warning, I would say that if water superintendents and commissioners who may be tempted to buy English pipe because of low cost will write me personally I will be glad to give them information on the subject.

It is the custom of liberal, broad-minded municipal water commissioners and superintendents to always consider a secondary supply. We, practically speaking, have none. Our neighboring cities are connected not only by their own supply but with the Metropolitan system. We felt the need of a secondary supply during our water famine and arrangements have now been made whereby we may connect with the city of Newton by three connections. Should anything of the sort occur again, we will be able to call on the city of Newton for assistance.

The WEEK'S NEWS

Governor Glynn Favors Brick Pavements—Utah Health Board Offers Cities Septic Tank Plans—Cleveland (O.) to Spend $2,500,000 to Purify Water—San Francisco Fire Committee Wants $494,200 for Motor Apparatus—Buffalo to Vote on Commission Government—Smoke Consumer Saves Fuel Bill—Proposed Municipal Market for Providence.

ROADS AND PAVEMENTS

Contemplate Construction of $6,000,000 Bridge.

New Orleans, La.—This city contemplates the construction of a bridge for steam and electric railway and other traffic, which will span the Mississippi River. To be financed by the sale of $6,000,000 five per cent bonds, the bridge will require three years to complete from the time of starting the construction. A. McGuirk, special bond attorney for the board of port commissioners, returning from New York and Chicago, said the following: "I regard the bridge at New Orleans as a definite proposition. It has passed all experimental stages. It can be built, and bond houses tell me the bond issue will sell at par in forty-eight hours after it is offered. The only legislation they will require is a city and state guarantee of the interest on the bonds during the construction period. It will take three years to build, and say two years to get well under operation. That would mean $1,700,000, at the outside, which would have to be guaranteed. After that the bridge will easily earn 5 per cent on twenty millions." Plans for the bridge have been drawn up by the Phoenix Bridge Company, of Philadelphia. The length of the bridge proper, it is reported, will be 2,280 feet and the span will be 105 feet above low water and 85 feet above high water. The total length of the steel structure will be about two and one-tenth miles.

PROPOSED NEW ORLEANS BRIDGE TO SPAN MISSISSIPPI RIVER.

Will Use Traction Engine on State Highway.

Placerville, Cal.—A thirty-horsepower gas traction engine has been received from Stockton for a trial on the state highway between here and Lake Tahoe. Should it prove satisfactory it will be purchased by the state at a cost of $2,500. It is estimated that the machine will do the work of fourteen horses, and that within a year it will pay for itself. Last year the up-keep of this road amounted to $4,000, and teams, which were hard to secure at times, did the grading, hauling, etc.

Governor Glynn Favors Brick Highways.

Albany, N. Y.—Gov. Glynn sent a special message to the Legislature last Monday night, in which he urged a change of policy in relation to the building of the state's highways. He believes that the people will vote no more money for road construction, having already authorized the use of $100,000,000 for that purpose. Brick instead of macadam roads are advocated in the message, for, according to the governor, the latter roads are not suited for heavy automobile traffic. "If the roads we build in the future cost as much as those we have been building it will require an additional $30,000,000 to complete the proposed system," said Gov. Glynn in his message. "On New York's 12,000 miles of macadam roads the annual maintenance will be $12,000,000, the total cost of the roads will be $130,000,000, and at the end of ten years from the date of completion the state will have little to show for an expenditure of $250,000,000. In the twenty years thereafter the tax for highways will be at least $20,000,000 each year if our roads are to be kept in proper condition."

The governor recommends that the state go into the business of manufacturing vitrified paving brick with convict labor.

Work on 175-Mile Boulevard.

Redwood City, Cal.—San Mateo county is making the fastest progress in road construction in the history of the state, according to figures just prepared by County Surveyor J. V. Neuman. Although it was only four months ago that the first bonds of the $1,250,000 issue for good roads were sold, $249,000 worth of work is now under construction, and specifications have been adopted for $250,000 more. The work under way represents six different contracts. It included the paving of the state highway through the cities of San Mateo and Redwood City, the paving of roads from Redwood City to Menlo Park and from San Bruno to South San Francisco and the grading of the ocean boulevard from Colma to Edgemar and San Pedro to Montara. Rights of way are now being secured by District Attorney Swart for the mountain boulevards. At the rate the work is going ahead, San Mateo county will have for the 1915 visitors a 175-mile system of boulevards costing $1,500,000 and including 125 miles of paved roads.

Highway Being Rapidly Built.

Columbus, Ga.—The highway between Columbus and Warm Springs is being rapidly completed, according to County Engineer Lane, who is in charge of the work. Practically all of that section between Waverly Hall and Oak Mountain Springs, the roughest part of the line, has been finished, and work on the remainder of the road is being pushed. In Muscogee the road is worked out to the Harris county line, and much of the highway through Harris has been completed.

City Buys Road Grader.

Ottawa, Kan.—The county board has completed a purchase of a large power road grader of the latest improved and approved style. It is a "Mammoth," made by the Austin-Western Company, for which the price is $650. The machine is made principally of steel is constructed to be operated by a traction engine, does its own plowing in any kind of ground, and the blade is arranged to be pulled instead of pushed.

Will Have Engineer In Each County.

Albany, N. Y.—Commissioner of Highways John N. Carlisle has announced that he will station an engineer in each county of the State. The engineer will make a study of the highways to be constructed, material available, rock, gravel, etc., with the purpose of securing better roads constructed at the least possible cost.

Will Spend $100,000 on Roads.

Hendersonville, N. C.—County Road Supervisor P. F. Patton is completing the survey of the last link of the Asheville-Spartanburg highway, which passes through Hendersonville. Polk county is spending $100,000 in road building and will soon complete its portion of the highway which passes through Saluda and Tryon. Henderson county authorities promised to meet Polk county at the line with a good road.

Prohibit Tearing Up New Pavement.

San Francisco, Cal.—To protect the new pavement to be laid on 3d street, the supervisors propose to order that it shall not be torn up for at least two years. Whatever pipes and conduits must be laid in 3d street will have to be put down before the paving is done. An ordinance revoking all permits for excavations in 3d street and prohibiting the Board of Public Works from granting other permits within two years after the ordinance goes into effect, which will be in sixty days after its passage, has been drafted and presented to the Board of Supervisors. Vitrified brick will be used for paving 3d street.

SEWERAGE AND SANITATION

Board of Health Offers Septic Tank Plans.

Salt Lake City, Utah.—Dr. T. B. Beatty, of the State Board of Health, has announced that plans of septic tanks were at the disposal of all cities that wished to employ this method of eliminating unsanitary conditions resulting from sewage. Following these plans, the city of Milford is constructing a big septic tank designed to take care of all its sewage. Dr. Beatty says that any little city or town may have the use of the plans free of charge provided they show sincere intention of constructing a septic tank.

Dr. Beatty has estimated that the cost of constructing septic tanks will range from $1,500 to $3,000, according to the population of the city or town in which they are placed. They may be constructed by skilled workmen of almost any small city or town under the direction of some one familiar with construction work. There will be no danger of infringing on patents.

Sewerage System Nearing Completion.

Council Bluffs, Ia.—With the completion of the main sewer of the system now under construction in West Council Bluffs, there still remains the laying of about 4,000 laterals. The trenches for the laterals will be dug with a ditch digging machine, purchased by Contractor Wickham, and will be from five to ten feet deep and from twenty to forty feet in length. For most of these connections four-inch pipe will be used. It will require several weeks to complete the pumping station, which will be built of reinforced concrete throughout. Two wells beneath the station, which will form the means of attaining an altitude for the sewage on its way to the river outlet, are to be of solid walled concrete and steel vats.

Plan "Clean-Up Week."

Philadelphia, Pa.—Preliminary plans for "Clean-Up Week" have been formulated at a meeting held in the office of Mayor Blankenburg. From April 20 to 25 has been set as the time in which householders and business men are expected to do their share in making the city cleaner, healthier and more attractive. To have everything spick and span at the end of the period is the desire of the municipal authorities and citizens who are interested in the movement.

East Orange, N. J.—Commisisoners Cook and Mooney and Inspector Bowman of the East Orange Board of Health have been appointed by that body a committee to prepare for "clean-up week" in the city some time in April. They will name the date, which will probably be later than last year to make sure of open weather for the campaign. Dr. R. H. Hunt, another member of the board, who has been elected president of the State Mosquito Extermination Commission, discussed the plans of the organization for war upon the pest this year.

WATER SUPPLY

Will Spend $2,500,000 to Purify Water.

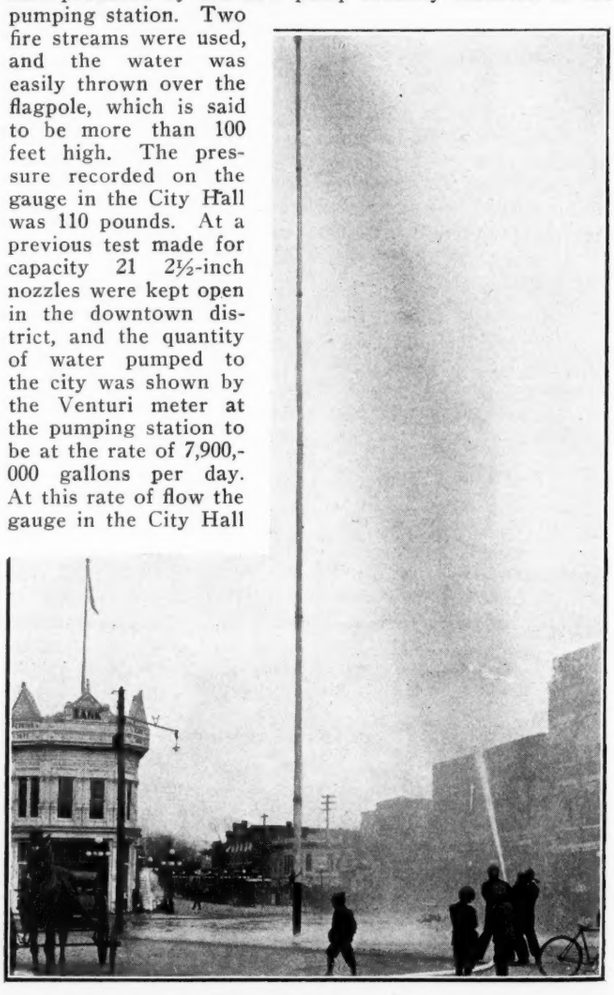
Cleveland, Ohio.—The bonded indebtedness of Cleveland will be increased to $2,500,000 between March 30th and June 30th in order to provide for a $1,300,000 filtration plant and sewage disposal to cost $1,200,000. At present, $900,000 is being spent to construct an intake tunnel to obtain better water for the filtration plant. To prevent river pollution, the authorities have found it well to comply with the request of the State Board of Health by constructing three disposal plants, one at Newburg Heights, the second at Old White City, and the third at the eastern end of Edgewater Park. Some difficult engineering problems will, it is expected, be encountered in the building of a five-foot intercepting sewer which will lead to the Newburg Heights disposal plant. For instance, there will be three and a half miles of tunnel work, and at one point the sewer will be 100 feet underground. The cost of the sewer, according to Sanitary Engineer Pratt, will be $600,000.

Adequate Pressure at Fire.

Springfield, Mass.—A few weeks ago a report was circulated to the effect that a break in a water main had caused a $100,000 fire loss. Several hydrants were, it was said, without water at the time of the fire and the pressure was inadequate. From Supt. A. E. Martin a communication was received which indicates that the report in question was entirely incorrect. The real facts disclose that the break in the main had been shut off and controlled before the fire started. The recording pressure gauge in the main office of the water department showed no appreciable diminution of pressure during the fire.

Fire Pressure Effective.

Coffeyville, Kan.—A demonstration has recently been made by the fire department on the plaza to test the pressure produced by the new pump recently installed in the pumping station. Two fire streams were used, and the water was easily thrown over the flagpole, which is said to be more than 100 feet high. The pressure recorded on the gauge in the City Hall was 110 pounds. At a previous test made for capacity 21 2½-inch nozzles were kept open in the downtown district, and the quantity of water pumped to the city was shown by the Venturi meter at the pumping station to be at the rate of 7,900,000 gallons per day. At this rate of flow the gauge in the City Hall registered 50 pounds pressure. Mr. Helmering, commissioner of water works and street lighting, stated that the new improvements recently completed at a cost of $140,000 will now give the city adequate fire protection and sufficient water for all purposes.



Courtesy Supt. C. E. Stromquist.
TESTING FIRE PRESSURE ON PLAZA.

Two Plans for Purchase of Water Plants.

Trenton, N. J.—The nine municipalities interested in the proposition of purchasing the properties of the East Jersey Water Company and its allies controlled by the New Jersey General Security Company have been notified by the State Water Supply Commission of alternative plans for the operation of the plants in the event of the purchase being consummated. The East Jersey Company has refused to recede from its position that the properties as now managed must be kept intact until at least one-half of the bonds to be issued in payment for them have been retired, or at least until five years have passed after the date of the transfer of the properties. To meet these conditions the Water Supply Commission suggests first that the plants be operated as a whole as they now are by the New Jersey General Security Company, or, as an alternative, that Paterson, Passaic and Montclair should co-operate at once to advance sufficient funds to pay off one-half of the bonds now proposed to be given to the company. If this arrangement should be agreed to, the commission points out that it would at once be released from its obligations to operate the plants as a unit and could turn over the distribution systems to the several municipalities. Under the terms of the second plan, the amounts to be advanced by the three municipalities would be: Paterson, $500,000; Passaic, $150,000; Montclair, $100,000. With these funds advanced, the commission would be in position to turn over the distribution systems to the municipalities concerned.

Plan to Lessen Water Waste.

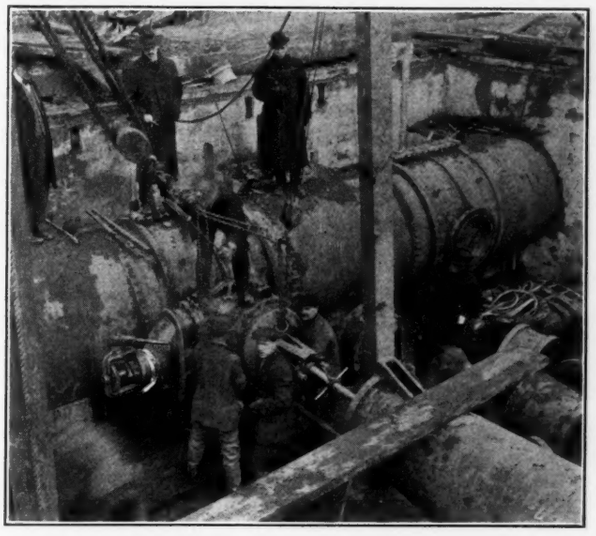
Camden, N. J.—With a proposition of saving from three to four million gallons of water per day, a representative of the Pitometer Company, of New York, explained the efficient use of the pitometer to the Council's water committee. There were several propositions, in fact, looking to the installation of instruments and the supervision of them by experts in order to ascertain where any leakages are. It was declared that in perhaps eighty cities where the Pitometer has been installed there has been a saving of millions of gallons of water. New York was given as an example. It was asserted that there 22,000,000 gallons are saved daily. Other cities throughout the country and Canada were cited as instances where the operation of this machine under the guidance of experts has saved great quantities of water. The committee took a keen interest in the proposition but felt unable to go into the proposition just yet.

Suit Threatened Over Filter Plant Work.

Baltimore, Md.—In awarding the contract for furnishing and installing the mechanical equipment for the new filtration plant at Lake Montebello, the city is meeting with many legal entanglements. Already the Norwood Engineering Company, of Florence, Mass., has filed a suit in the local courts to enjoin the board of awards from proceeding with the work, claiming that the specifications under which the bids were made contain patent infringements. When the board of awards formally gave the contract to the American Water Softener Company, of Philadelphia, the city was made liable to at least two more lawsuits. M. L. Bayard, of Woodbine, N. J., the lowest bidder for the contract, now threatens to appeal to the courts, and I. H. Jewell, of Chicago, has repeatedly notified the city that he will sue on the ground of patent infringements.

Tap Huge Water Main at Filtration Plant.

Pittsburgh, Pa.—The first step in supplying filtered water to the North Side district of Pittsburgh was taken March 18 by Mayor Joseph G. Armstrong with the members of his cabinet and city councilmen when the big 60-inch rising main was connected with the filtered water supply at the Aspinwall filter beds. After 18 years of effort toward obtaining pure water for the old Allegheny City section, it is definitely promised that the filtered water will be supplied to patrons April 1. There were no formalities at the tapping of the giant main. While the city officials stood at the edge of the trench skilled workmen leaped upon the huge joints of the pipes and, setting the cutting machine in the big tube, set the valves while the steel began gnawing at the main. The project is considered a difficult piece of pipe-tapping, and will set a record in hydraulics. The plan adopted is one that has been worked out by the superintendent of the Bureau of Water, Charles A. Finley. It was impossible to cut a 60-inch hole in the full main. Two 36-inch taps were considered, but this was discarded in favor of three 24-inch taps. The new main leading from the pumping station to the old main was divided into three 24-inch mains. These were led up to the old main. Three sleeves were placed about



STARTING 24-INCH CUT INTO MAIN.

the old main, each of which carries a valve, and on the valve is screwed a "cutting head." Here some delicate work began. The drill, a central bit, surrounded by a 24-inch circular cutting edge, is pushed through the valve which has been drawn back out of the way. Then the big main is drilled through. A circular piece 24 inches across is cut out of the pipe. The drill and the piece cut out are drawn back through the valve and the valve closed, shutting off the water. Then the cutting head is unscrewed from the valve and the 24-inch main is screwed down on the valve, the valve opened and the connection made. Three times this was done, and at the end the 60-inch flow was diverted from its original source at Montrose to its new source at Aspinwall.

STREET LIGHTING AND POWER

Mayor Advocates Municipal Light Plant.

Elmer, N. J.—A municipal electric light and power plant boom, sponsored by Mayor J. G. Brooks, has been the outgrowth of the light war at Elmer. It has delayed Council's plan of arranging a compromise with the New Jersey Gas Company for a new five-year contract for lighting the streets with gas lamps. When the old contract expired the town was left in darkness. Mayor Brooks is bitterly fighting the gas contract and declares that the cost of the town's operation of its own electric plant would be less than paying for gas. He estimates the original outlay at $14,000.

Pass Fifty-Year Lighting Franchise.

Frederick, Md.—At a recent meeting of the Board of Aldermen of Frederick it was unanimously decided to extend the lighting franchise with the Hagerstown & Frederick Railway Co. for fifty years. About fifty people, representing the financial and professional men of Frederick, were present and asked that the franchise be passed. This franchise is to replace the one, relinquished by the trolley company, that would have expired in 1922.

New Light System Celebrated.

Lebanon, Kan.—The current from the new $18,000 municipal light plant was used last week for the first time in illuminating the streets of Lebanon. The affair was cele-

brated by a well attended reception at the Commercial Club and an electrical exhibition. At present the charge for current from the plant is twelve cents per kilowatt, which is three cents lower than the rate prevailing in most places.

Rigid Gas Regulations Ordered.

Columbus, O.—A set of proposed standards and regulations for artificial and natural gas service in Ohio, which will require a better quality of gas and more rigid inspection of meters, has been announced by the State Utilities Commission after an investigation of the service in Cincinnati and other cities. Under the new schedule artificial gas must have a monthly average total heating value of not less than 550 British thermal units per cubic foot, and the natural product must measure up to a monthly average heating value of not less than 800 B.T.U. per cubic foot. The larger gas companies will be compelled to provide themselves with complete standard calorimeter outfits, and shall make tests therewith at least three days a week of artificial and once each week of natural gas supplied to consumers.

Tacoma Will Have Luminous Arc Lamps.

Tacoma, Wash.—Luminous arc lamps are soon to be installed along Tacoma's main business street, according to an announcement made by Supt. Collins of the light plant. On three other streets ornamental pedestals are to be erected. Most of the necessary material has already been received, while advises to the department indicate that the balance of the material is in transit.

Will Spend $25,000 to Bury Wires.

Elizabeth, N. J.—Under the terms of the contract made by the Public Service Electric Company with the city early in 1913, the sum of $25,000 will be spent by the former this year in putting electric wires underground. It is the expectation of city officials that the work will be commenced as soon as the weather conditions permit. In view of the criticisms of the overhead wire system after the blizzard a few weeks ago, the contract with the Public Service is of special interest. Councilman Brucklocher said that the Public Service claims to have spent $60,000 in 1913 to remove overhead wires.

MOTOR VEHICLES

Ask $494,200 for Additional Motor Apparatus.

San Francisco, Cal.—The fire department budget for the next fiscal year, which is to be submitted to the finance committee of the supervisors, calls for a total of $2,192,118. The fire commission asks in the proposed budget for $494,200 for motor apparatus, including hose wagons, monitor batteries, pumping engines, squad wagons and hook and ladder trucks. Thirty-seven tractors for converting horse-drawn engines and trucks into motor apparatus are also to be bought. One item is for $5,000 for the entertainment of visiting fire department officials from other cities during the exposition. The salary of the fire department physician, now $1,800 a year, is put at $4,000 in the new list, with the understanding that he shall devote all of his time, instead of a few hours daily, as at present, to his departmental duties. The formation of three new engine and two truck companies is proposed, and a flying squadron also is to be organized for the purpose of giving probationary members experience in fighting fires.

Test Auto Pumping Engine.

Rome, Ga.—The new auto pumping engine, made by the American La France Company, was received last week and put to its first test. As far as the capacity of the 90 h.p. engine was concerned the test proved satisfactory, a stream of water being thrown over 200 ft. A further demonstration was made last Thursday which showed that the efficiency of the engine easily came up to the company's guarantee.

Committee Favors Complete Motorization.

Newport, Va.—If the recommendation of the fire department and water committee of the council is adopted, the next few months will see the motorization of the entire fire department. That body at its recent meeting has voted unanimously to ask the council to include in the next budget an appropriation of $10,000 with which to equip the Central and North End stations with motor-driven fire apparatus. The members of the committee were unanimous in the opinion expressed by Chairman E. E. Christie that it would be economy to expend this amount even if the money has to be borrowed. The belief was strengthened by a report from Fire Chief Stow which showed that the average cost per month of maintaining the combination fire truck, chemical engine and tractor in the East End station, which does away with all horses at that station, is $1.87. This average includes the cost of breaking men in to run the machine during the first month. For the month of February it cost 50 cents to operate the machine and so far this month it has cost nothing, supplies and gasoline purchased during the previous month being enough to run it through. It costs on an average of $15 per month to feed each of the fire horses, exclusive of shoeing.

GOVERNMENT AND FINANCE

Buffalo to Vote on Commission Government.

Albany, N. Y.—The Senate last Monday passed the Buffalo Charter bill, notwithstanding the veto of Mayor Fuhrmann. The mayor objected to the method of removing the appointed officials. Senator Ramsperger defended the mayor's course, and offered an amendment to refer the message to the Cities Committee. The amendment was defeated and the bill was repassed, 39 to 9. The bill provides a commission form of government for Buffalo and submits the proposition of its enactment to the voters of that city at the election next fall.

Commission-Manager Plan Voted.

Albany, N. Y.—The Olean City Commission-Manager Charter bill, one of the broadest suggested at this session of the Legislature, has passed the Assembly unanimously. By the provisions of the bill it would be possible to recall the five commissioners who would have charge of civic affairs. A petition signed by 25 per cent of the registered vote would bring about a recall election and a majority vote would remove. The five commissioners would employ a manager. He would act as the administration head of the city. The commission would be the legislative body. All officials except the manager would serve without compensation.

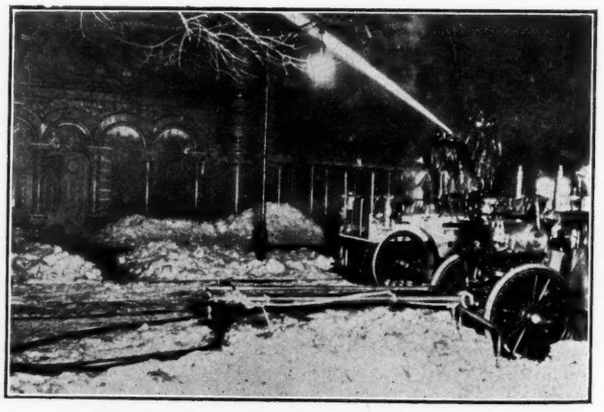
File Petitions for Commission Government.

Irvington, N. J.—Petitions for a special election to adopt or reject commission government have been filed in Irvington in the office of the town clerk by the Commission Government League of that place.

FIRE AND POLICE

Fire Totally Destroys Structure.

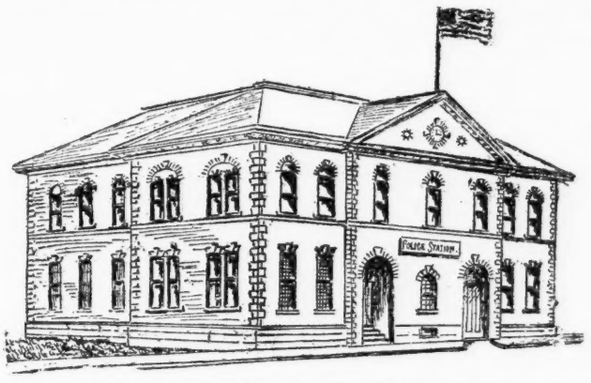
Brooklyn, N. Y.—The accompanying illustration shows the scene at a recent fire in Brooklyn, occurring after the heavy snowstorm, which totally destroyed St. Mark's Church.



Courtesy Brooklyn Daily Eagle.
SCENE AT RECENT BROOKLYN FIRE.

Plan New Police Station for Newport, R. I.

Newport, R. I.—Plans for the new police station were submitted to and approved by the Board of Aldermen at their recent meeting. The structure will be of Colonial design, built of red brick with limestone or granite trimmings, and with a slate roof. On the first floor, the plans call for an entrance hall and an office, 17 feet by 19 feet, leading to a cell room that will include 14 cells of



POLICE STATION FOR NEWPORT, R. I.

the latest and most modern construction. There will be a garage and chauffeur's room on the same floor, together with separate rooms for juvenile prisoners, for adult females and for a matron. A morgue has been provided for in the northeast corner of the building. The remainder of the floor will be given over to a locker room, houseman's sleeping room, a "safe room" for valuables, a boiler room and ample toilet facilities. On the second floor will be the private office of the chief of police, an office for the inspector, rooms for the captain and sergeants, 12 large airy sleeping rooms which will accommodate 24 of the men and easily more than that number if an increase be found necessary, a large recreation room, 28 feet by 20 feet; a bath room with shower baths and adequate other toilet arrangements. The structure will be lighted by electricity and gas, and probably steam will be used for heating purposes.

Hire Attorney to Secure Pay Increase.

Boston, Mass.—In a statement before the finance committee, R. S. Teeling, attorney for police and firemen, revealed the fact that he had received $9,433 for his services in urging a large increase in the salaries of his clients. In 1912 approximately $137,500 was added to the pay of the police alone. Mr. Teeling's services consisted in bringing effective arguments before the mayor and police commissioner, compiling and presenting comparative salaries statistics of policemen in other cities, together with figures indicating the high cost of living. As a result of his efforts a second increase in salaries went into effect early this year.

STREET CLEANING AND REFUSE DISPOSAL

Dumping Ice Into Sewers.

Passaic, N. J.—City Commissioner W. A. Reid has set a gang of twenty men to work removing the ice which had formed in Main Avenue since the last storm. About eighty per cent. of the ice is being thrown into the sewer. It is chopped up and shoveled into the manholes. Some of the ice, which is a considerable distance from any manhole, is loaded on wagons and carted away. "We are saving about seventy-five per cent. of the total expense of the work by throwing the ice into the sewer," said Commissioner Reid. "What is more, the men I have at this work can do as much in half a day as they could in a whole day with five teams and wagons."

Use Abandoned Mines for City Dump.

Springfield, Ill.—The city has abandoned its dump located at Meller street and West Grand avenue, and will prevent any further disposal of garbage and rubbish in that section. So rapidly is the city embracing wider territory for residential purposes, that it becomes very difficult to secure dumping grounds. Commissioner F. H. Hamilton has hit upon the idea of utilizing the abandoned coal shafts about the city as a depository for waste material. There are several within short driving distance of the city that might be used to advantage. The incineration of garbage is now being tried as an experiment, but even if that should ultimately prove satisfactory, the question of rubbish disposal will remain.

Experiment on Garbage Collection.

Syracuse, N. Y.—Commissioner S. Van Wagner has placed in use a three-ton motor truck with which the experiment of the new garbage collection system will be made. Upon the truck, that has been rented for a short period, will be built a set of racks to support receptacles in which the refuse will be carried to the reduction plant. It was reported that Commissioner Van Wagner would soon purchase 500 or more galvanized cans, of proper construction, which will be used to make the experiment. Half of these cans will be distributed among householders in a certain section and the other half will be reserved. On the first garbage collection day the truck will go through the streets picking up the loaded cans and leaving empty ones in their places. The distribution of cans will be so arranged that a certain number will be collected every day. Thus the new truck will be in constant use during each day of the two weeks' period for which it has been rented.

Two Cities Would Share Garbage Plant.

Benton Harbor, Mich.—This city figured to some extent in a recent meeting of the St. Joseph city council when City Attorney G. M. Valentine, of Benton Harbor, addressed the meeting on the joint disposal of garbage in one of the new plants, such as had been proposed at a meeting of the Benton Harbor council. It is proposed to buy a plant large enough for the use of both towns, and to locate it at a central point. Inasmuch as Benton Harbor and St. Joseph have alike been faced with the refuse question, aldermen of the two cities are interested in a plan presented by H. L. Wagner, of Huntington, Ind., now being used in that city.

Use Road Roller to Flatten Out Drifts.

Waynesboro, Pa.—A new use for the road roller has been found by Superintendent M. K. Burgner of the state roads in this county. The road between Greencastle and Chambersburg was badly drifted during recent snows, and the farmers were compelled to drive through the fields at places. Mr. Burgner opened some of the drifts by driving the steam road roller through them, first making a way with shovels and men.

Will Hold Conference on Snow Removal.

Philadelphia, Pa.—City officials and representatives of transit companies from many cities are coming to Philadelphia on April 17 for a conference on the problems of the most efficient and economical methods to be employed in snow removal. Mayor Blankenburg suggested the conference and Director Cooke is sending out the invitations. Mayor Blankenburg will entertain the visitors on the night before the conference with a dinner at the Union League.

RAPID TRANSIT

To Vote on City Purchase of Railroad Stock.

Merrill, Wis.—The building of Merrill's municipal railway is rapidly aproaching the point of actual operation. The final decision as to whether this city will financially aid the project will rest with a special election, when the voters will be asked to decide whether the municipality may purchase stock of the new line. The proposition is perhaps unique in the history of American railroading. The city of Merrill, complaining that its shiping facilities were monopolized by one of the great railroad systems and that it was impossible to secure the building of a branch of a rival road into this territory, began negotiations with local and outside capital for the building of an independent railroad, to run east and west. This railroad was to connect with two other great systems and thereby give Merrill transportation facilities to aid the industrial growth of the mu-

nicipality. Merrill, situated on the Wisconsin River, with an enormous water power available, believes it has an industrial future of the greatest promise. The residents of the Northern Wisconsin territory through which the line is to run, have completed all preliminary work for a road about forty miles in length.

City Cars Ready Before Contract Time.

San Francisco, Cal.—An increase of the bonus for completing the addition to the Geary street car barn ahead of the contract time has been recommended to the board of public works by City Engineer O'Shaughnessy. He said that the new cars for the Municipal Railway would be ready for delivery sixty days earlier than the date set in the contract, and that the speedy construction of the barn was necessary. The barn contract allows a bonus of $250 a day for thirty days, and O'Shaughnessy asked that the bonus period be fixed at forty days, making it possible for the contractor to earn $10,000 by expediting the work. The works board referred the suggestion to the public utilities committee. The works board awarded the contract for furnishing concrete trolley poles for the Van Ness avenue line to the H. S. Tittle Company for $33,256.

Pass Subway Measure.

Providence, R. I.—In accordance with a resolution passed by the Board of Aldermen, the city solicitor will be directed to appear before the General Assembly to apply for legislation permitting the city to take up the matter of a subway system. The resolution also passed the Common Council by a large majority.

Street Car Strike In Terre Haute.

Terre Haute, Ind.—A strike of union street car employes was followed by trouble in the streets, which the police were powerless to stop. Conductors and motormen were pulled from the cars. After breaking the windows out of a dozen cars which were stalled in the business section, the crowd did a great deal of damage to clubhouses and broke many plate glass windows.

MISCELLANEOUS

Municipal Ferries To Be Used in Floods.

Binghamton, N. Y.—Superintendent of Streets E. Guilfoyle is arranging for municipal ferries in the First Ward and other parts of the city in case of high water, so that persons living in flooded parts may be easily transported from place to place. In the past it has been customary for boat owners to charge 25 or 50 cents and even $1 for carrying passengers to and from their homes. Anticipating similar conditions this year, Superintendent Guilfoyle is hiring row boats which will be located on streets specified. All passengers will be carried free of charge at the expense of the city, which will pay for the boats and the men to operate them. The service will begin as soon as the water reaches a point in the various sections where boats can be manned.

Propose Municipal Market for Providence.

Providence, R. I.—Mr. G. F. Hall, of the architectural firm of Martin & Hall, has suggested that the proposed municipal retail market in Providence be erected over the Woonasquatucket River. He suggests the construction of a central abutment in the river at a suitable point, the roof of the building being carried on trusses spanning the river from shore to shore.

According to the proposed plan, the floor area of the building will be about 75x250 feet, which is thought to be amply large for the purpose. The city engineer states that the abutment in the middle of the river at this point will not hinder the flow of the stream. The retaining walls on either side are said to be in need of repair, which would be taken care of in the construction of the proposed building. A significant argument advanced by Mr. Hall, as a reason for the construction of a building of this type at the location recommended, is the fact that in the event of the failure of the municipal market proposition, at any time, the building would be fitted by location and construction, for rental for exhibition purposes.

Demonstrate Smoke Consumer.

Flint, Mich.—An exhibition has been given of the steam jet smoke consumer which was recently installed at the city hall. That the device actually consumes smoke was demonstrated to the satisfaction of all present. With the valves which control the four jets of the device turned off, Engineer F. Burton fired up the boilers and the crowd which watched outside the building saw dense clouds of black smoke rolling out of the chimney. A signal was given to turn on the steam jets, and in about twenty seconds after the signal was given the amount of smoke coming out of the stack was reduced 75 to 90 per cent. An interesting fact brought to light through the demonstration is that a grade of coal that costs about $2.90 a ton less than that which was previously used in firing the city hall boilers has been used since the consumer was introduced. The same result is obtained with the cheaper coal and there is not nearly as much smoke by the use of the consumer as there would be if the higher grade of coal was used and no consumer installed.

Favor Public Buildings for Polling Places.

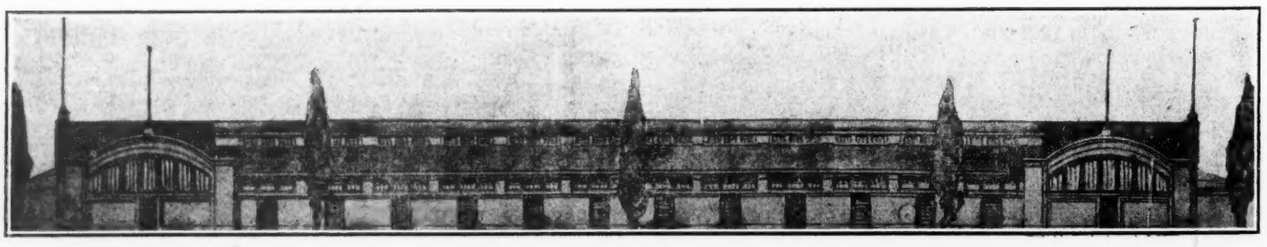
New York, N. Y.—The Board of Estimate has decided to approve the bill now in the Legislature amending the election laws of the State so as to permit the Board of Elections of the city to designate any public building or any schoolhouse in the city as a place of registration and election. President McAneny reported that an investigation had showed that it was practicable to use a number of schoolhouses for this purpose without in any way interfering with the regular activities of the Board of Education and that at the same time it would greatly improve the conditions under which registration and balloting were carried on.

Public Service School Well Attended.

New York, N. Y.—An excellent idea of the results accomplished by the Training School for Public Service conducted by the Bureau of Municipal Research is given in the second annual report, which has been made public. Eight hundred and forty-seven persons from 138 cities in thirty-five States have applied for membership to date, and the ninety-two who were enrolled included civil, electrical, sanitary and consulting engineers, school superintendents, principals and teachers, a former Judge and a State Budget Commissioner. More than 100 employes of New York, Hoboken, Passaic and other cities also attended lectures on municipal efficiency.

Open Municipal Refuge.

Montreal, Canada.—The new Meurling municipal refuge which has opened here is expected to help materially in the problem of caring for the unemployed and homeless of Montreal. The refuge cost $160,000 and contains accommodations for about 600 inmates.



Courtesy Providence Journal.

SUGGESTED PLAN FOR MUNICIPAL MARKET IN PROVIDENCE.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Injuries—Icy Streets.

Finnane v. City of Perry.—A city is not bound to remove all snow and ice from its sidewalks but is required to use ordinary and reasonable care to remove defects arising out of conditions occurring after the snow has fallen.—Supreme Court of Iowa, 145 N. W. R. 495.

Attorney Employed by Mayor—Right to Compensation.

Mosher v. City of Elmira.—An attorney employed by the mayor of the city of Elmira under authority of City Charter, to prosecute, within the city, a violation of the criminal law, is entitled, after due presentation of his claim to the council and its rejection, to sue for the compensation agreed to be paid.—New York Supreme Court, 145 N. Y. S., 964.

Injuries From Fireworks—Torts.

Reider v. City of Mt. Vernon—To make the city liable for injuries from the explosion of fireworks in the city under permit from the mayor, he must have been authorized by statute or by ordinance to permit the doing of such an act, which was dangerous in itself, so as to constitute a nuisance.—New York Supreme Court, 145 N. Y. S., 697.

Intoxicating Liquors—State and Municipal Regulations.

City of Shreveport v. Maroun.—The council of the city of Shreveport is without authority to direct the city court to issue a search warrant for intoxicating liquors. The Legislature has authorized the issuance of search warrants for stolen property only.—Supreme Court of Louisiana, 64 S. R. 388.

Construction of Lighting Wires—Negligence.

Asher v. City of Independence et al.—A city operating an electric light plant was negligent in stringing its highly charged wires along an alley within eight or ten inches of a building, and in failing to remove the danger caused by the subsequent construction of a fire escape within a few inches of the wires.—Kansas City Court of Appeals, Missouri, 163 S. W. R. 574.

Improvement of Public Square—Apportioning Assessments

Madison County v. City of Winterset.—The benefits arising out of the improvement of streets around a public square in a municipality must be equitably apportioned, and both the area rule and the front-foot rule may be considered in determining the benefits to the county for pavement of the streets in front of the county courthouse.—Supreme Court of Iowa, 145 N. W. R. 492.

Personal Injuries—Icy Sidewalks.

Swan v. Borough of Indiana.—Where a pedestrian is injured from a fall on ice formed on a sidewalk by the freezing of slush the night before the accident and only a few hours prior thereto, the borough is not liable for the resulting injury in the absence of actual notice to it of the condition of the sidewalk prior to the accident.—Supreme Court of Pennsylvania, 89 A. R. 664.

Police Regulation—Statutes.

City of Portland v. Parker.—Const. as amended in 1910 providing that the legislative assembly shall not enact, amend, or repeal any charter or act of incorporation for any municipality, and giving the legal voters of every city and town power to enact and amend their charter, does not repeal a city ordinance, adopted in 1904, defining and punishing vagrancy.—Supreme Court of Oregon, 138 P. R. 852.

Personal Injuries—Streets—Repair.

O'Connell v. City of Davenport.—A city is not liable for consequential damages resulting from repairing streets if the work is not negligently done; it being necessary, to make it liable for injuries by falling over brick which were loosened in repairing the street, that the work be negligently done and that the injury proximately result from such negligence.—Supreme Court of Iowa, 145 N. W. R.

Streets—Establishment of Grade—Changes.

Brown v. City of Sigourney.—A street grade cannot be established by a city by the mere act of its officers in lowering or raising the grade, but can only be established by an ordinance. Until the grade of a street is established, a city is liable to adjacent property owners for damages resulting from changes in the surface of the street.—Supreme Court of Iowa, 145 N. W. R. 478.

Corner Lot—Limit of Amount of Assessment.

Durst v. City of Des Moines et al.—Where the streets upon which a corner lot abutted were separately improved at a total expense in assessments of more than 25 per cent of the value of the lot, the two sets of pavements did not constitute one single improvement within the purview of Code Supp. 1907, providing that no assessment for special improvement shall exceed 25 per cent of the value of the land.—Supreme Court of Iowa, 145 N. W. R. 528.

Suits for Infringment—Unfair Competition.

Clip Bar Mfg. Co. v. Steel Protected Concrete Co.—An adjudication of the invalidity of a patent in one circuit does not render the question res judicata except as between the parties to the suit, nor prevent the bringing of other suits for infringement against different defendants in other circuits. Notices of claims of infringement given by the owner of a patent to customers of a manufacturer of a similar article, or even threats of suit, if in good faith, are within its rights and not actionable as acts of unfair competition.—United States District Court, 209 P. R. 873.

Vacation of Plat—Rights of City.

City of La Moure et al. v. Lasell et al.—Where the city has improved the streets and alleys, and laid crosswalks, sewers, and water mains, ordered sidewalks constructed, and done other acts of a public nature, and at the expense of the city within part of a plat attempted to be vacated by the filing of a declaration of vacation, the city has acquired rights which would be infringed or destroyed by the vacation of the plat, of which it cannot be deprived, at least without its consent.—Supreme Court of North Dakota, 145 N. W. R. 577.

Assessment Injunction—Estoppel.

City of Muskogee et al. v. Rambo et al.—Where there is jurisdiction, the property owner who sees such improvement made with knowledge that the municipal authorities intend to levy and assess a special tax against his property, and that those who do the work can be compensated in no other way, and offers no objection until after the work has been done, cannot resort to a court of equity to enjoin such assessment upon the ground that the proceedings subsequent to the ordinance of necessity have not been regular.—Supreme Court of Oklahoma, 138 P. R. 567.

Firemen—Laborers—Hours of Work.

Neely et al. v. City of Tacoma et al.—Members of the fire department of a city, who are paid monthly, though their salaries are based on the actual number of days they are on duty, are not "laborers," within Rem. & Bal. Code, providing that it is part of the public policy of the state that all work "by contract or day labor" done for it or any political subdivision created by its laws shall be performed in work days of not more than eight hours each, except in cases of extraordinary emergency.—Supreme Court of Washington, 138 P. R. 357.

"Asphalt Pavement" Defined—Hours of Labor.

Barber Asphalt Paving Co. v. Bancroft et al. Same v. Ross et al.—Where plaintiff executed a power authorizing an attorney to execute for it a contract for laying "asphalt" pavement on a certain street in a city, and there was evidence that asphalt pavement might be regarded as including any pavement made with asphaltum, the court properly held that the power authorized the execution of a contract to pave the street with "asphalt macadam" pavement.

Where a municipal improvement contractor was not bound by a contract provision limiting hours of labor, which limitation was not contained in the notices calling for bids, or in the detailed specifications for the work, it was not bound by a custom that employes on such work should not be required to labor more than eight hours a day.—Supreme Court of California, 138 P. R. 743.

Bridge Reconstruction—Railroad.

Minneapolis, St. P., R. & D. Electric Traction Co. v. City of Minneapolis.—The city of Minneapolis has no power to enter into a contract with a company operating a commercial railway, by which the city agrees to bear part of the expense of strengthening a city bridge which the railway company desires to cross with its cars, where the bridge is already of sufficient strength and construction to accommodate general travel, and the sole purpose of the improvement is to permit the operation of such railway cars thereover.—Supreme Court of Minnesota, 145 N. W. R. 609.

Street Improvements—Character and Effect.

La Franchi et al. v. City of Seattle.—Where a petition and ordinance for a street improvement provided that the city should be improved by grading or constructing a plank trestle as might be necessary between specified limits in accordance with plans and specifications of the city engineer, specifications calling for grading and constructing approaches and for building temporary sidewalks, costing nearly one-seventh of the entire cost of the improvement, were not within the description ot the petition and were unauthorized.—Supreme Court of Washington, 138 P. R. 659.

Directors of Improvement District—City Council.

Puryear et al. v. City of Jonesboro.—The power of the city council over the settlement of accounts of the board of directors of an improvement district, in respect to readjusting such accounts, which power is conferred by Kirby's Dig., § 5744, does not amount to a supervision or control of the action of the board in its management of water and light plants, but merely authorizes the council to audit the accounts of the board and disallow any improper charges and credits; and hence this section and §5740, requiring the filing of such statement, are not inconsistent with Acts 1905, giving the board of directors of an improvement district organized in the city of Jonesboro "complete and full control of the operation and management of the water and light plants."—Supreme Court of Arkansas, 163 S. W. R. 504.

Contract—Damages for Delay—Waiver—Decision of Engineer—Recovery of Overcharges.

Ritchie v. City of Topeka.—In a paving contract it was provided that time was material, that the work should be completed in a fixed time, and that the contractor would forfeit to the city $10 for each day of delay beyond the stipulated time. The city, by its own act and omission, prevented the contractor from proceeding with the work for a considerable part of the allotted time, and, when an application for an extension of the time was presented to the city authorities by the contractor, they agreed that the contractor should proceed with the work thereafter, and complete it within a reasonable time. Held, as the city, by its fault and neglect, prevented the contractor from proceeding with the work, and as it subsequently agreed to an extension of the time of completion, it waived the time provision of the original contract, and is not in a position to insist on a payment of liquidated damages for the delay in the completion of the work.

In the sewer contract it was provided that the work should be done under the supervision and to the satisfaction of the city engineer, that his interpretations of the plans and specifications were to be binding and final, that he was to decide all questions which might arise as to the amount and quality of the work done; and he or his assistant were present on the work almost every day during its progress. During the time the city engineer changed the grades of the sewers, thus relieving the contractor from much of the work provided for in the contract, and the contractor presented claims, and secured the approval of the same by the city engineer, for such material not furnished, and for a great deal of work that was not done. The estimates of the city engineer, which were not made in good faith, embraced large overcharges, and on these payments were made by the city without knowledge of their fictitious character. Held, that the fact that the estimates and decisions were made by the city engineer did not preclude a recovery of the overcharges by the city.—Supreme Court of Kansas, 138 P. R. 616.

Streets—Permissive or Adverse Use.

West v. City of Houston et al.—The burden of proof rests upon one asserting a prescriptive right of way over another's land to show that the owners of the servient estate were free from disability during the prescriptive period. Where the public use of premises is permissive, there is no basis for a claim of a right of way by prescription. In trespass to try title, a finding that an intervener would have purchased the property anyway, even if he had not thought it was a corner lot fronting 100 feet on a certain street, as appeared from plaintiff's concealment of the fact that it was not a corner, eliminated the essentials of an estoppel in pais in favor of intervener.—Court of Civil Appeals of Texas, 163 S. W. R. 679.

Annexation—Ratification of Contract.

Ettor et ux. v. City of Tacoma et al.; Howard et al. v. Same.—A city annexing a certain locality pending the execution of a contract between a railroad company and county commissioners made, while the county had jurisdiction therein, for the grading of a certain street, while not bound to act upon or continue the contract, yet which knew of the contract and which subsequently directed work thereon and repaired a water main broken during the work, though it never formally accepted the completed work, thereby ratified such contract and adopted it as a measure of the relative rights of the city and the railroad and as a proper municipal improvement, subject to payment of damages to abutting owners.—Supreme Court of Washington, 137 P. R. 820.

Street Improvements—"Block"—"Platted Property."

Walter C. Sivyer & Sons Co. v. City of Spokane.—In Laws 1911, providing that the assessment district for a street improvement shall include all the property between the termini of the improvement abutting on or proximate to the street improved to a distance back from the marginal lines thereof to the center line of the blocks abutting on the street, provided that in any case the distance back shall be at least 90 feet, or in case of unplatted property the distance back shall be the same as that included in the assessment of platted lands immediately adjacent thereto, the word "block" means the square included by four streets as located by the system of streets prevailing generally in the plat in which an assessment district may be located, the words "platted property" mean land included by regularly placed intersecting streets, and the term "unplatted property" means lands not so included, and fractional blocks and produced by interference with the general street scheme must be treated as platted property, while land so situated as to be capable of subdivision into ordinary blocks and fractions by the extension through it of streets, so as to preserve the general street scheme, must, until subdivided, be regarded as unplatted land, and, where land is readily susceptible of sub-division into blocks of ordinary size by a mere extension of streets which have never been laid out, the land is unplatted, and the line of an assessment district must not extend back on it further than on the platted property adjacent thereto. —Supreme Court of Washington, 137 P. R. 808.

Special Assessment—Distribution of Fund.

Spitzer et al. v. City of El Reno et al.—The scheme of the paving law of 1908 is to raise only such sum by special assessment as will pay the actual cost of the improvement and not to create a surplus; each year's assessment being designed to take care of its installment and interest and no more. Each lot and parcel of land in the improvement district must pay its share in the total cost and no more, though there be a delinquency on the part of some other property owner. Where a property owner pays more than his legitimate assessment for paving the surplus arising from an excessive assessment belongs to him and not to the bondholders, and they cannot enjoin the city from refunding such surplus. Sums collected by special assessment in excess of the amount actually needed held not a trust fund within Laws 1907-8, providing that paving assessments shall constitute a fund to be applied to the payment of "bonds and the interest thereon and for no other purpose."—Supreme Court of Oklahoma, 796 P. R. 797.

NEWS OF THE SOCIETIES

Calendar of Meetings.

April 4-11.
EFFICIENCY SOCIETY, INC.—First National Efficiency Exposition and Congress, Grand Central Palace, New York City. W. H. Tallis, exposition director, 41 Park Row, New York City.

APRIL 7-8.
MAINE ROADS CONVENTION—First Congress, under auspices of the State Grange and the Maine Automobile Association, Bangor. For information apply to Bangor Chamber of Commerce.

April 16-17.
TRI-STATE WATER AND LIGHT ASSOCIATION.—Annual Convention, Atlanta, Ga. F. C. Wyse, assistant secretary, Columbia, S. C.

April 23-24.
VIRGINIA PUBLIC HEALTH ASSOCIATION.—Annual meeting, University of Virginia, Charlottesville. Dr. M. G. Perrow, Lynchburg, Va., president.

May 11-15.
AMERICAN WATER WORKS ASSOCIATION.—Thirty-fourth Annual Meeting, Philadelphia, Pa. J. M. Diven, secretary, 47 State street, Troy, N. Y.

October 20-23.
INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.—Annual Convention, New Orleans, La. James J. McFalls, Secretary, Roanoke, Va.

May 18-23.
FIRST CANADIAN AND INTERNATIONAL GOOD ROADS CONGRESS.—The Arena, Montreal, P. Q. G. A. McNamee, General Secretary, New Beiks Buildings, Montreal.

MAY 5-7.
NATIONAL FIRE PROTECTION ASSOCIATION.—Annual Meeting, Chicago, Ill. F. H. Wentworth, Secretary, 87 Milk street, Boston, Mass.

June 1-3.
NATIONAL CONFERENCE ON CITY PLANNING.—Annual Meeting, Toronto, Canada. Flavel Shurtleff, Secretary, 19 Congress street, Boston, Mass.

June 3-5.
CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS OF THE STATE OF NEW YORK.—Fifth Annual Conference Auburn, N. Y. W. P. Capes, Secretary, 105 East 22d street, New York City.

June 1-5.
NATIONAL ELECTRIC LIGHT ASSOCIATION.—Thirty-seventh Convention, Bellevue-Stratford Hotel, Philadelphia, Pa. T. C. Martin, Secretary, 29 West 39th street, New York City.

June 30-July 4.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Seventeenth Annual Meeting, Hotel Traymore, Atlantic City, N. J. Edgar Marburg, Secretary, University of Pennsylvania, Philadelphia, Pa.

National Electric Light Association.

The thirty-seventh convention will be held at the Bellevue-Stratford Hotel, Philadelphia, Pa., June 1 to 5. Three meeting rooms on the ballroom floor will furnish accommodation for 2,000 members. The use of the whole roof garden will be reserved for members during the meetings. At the meetings it is proposed to limit the reading of papers and reports as much as possible and to develop discussion. Three or four special trains for the transportation of members will be arranged. The chairman of the convention committee is W. C. L. Eglin, vice-president of the Philadelphia Electric Company.

Engineers', Contractors' and Materialmen's Association of North Carolina, South Carolina and Georgia.

A meeting will be held in Charlotte, N. C., March 28, of about one hundred engineers, contractors and materialmen of the states of North Carolina, South Carolina and Georgia, for the purpose of forming a permanent association to assist towns and cities systematizing their contract work for permanent improvements, so that better results may be secured. A tentative organization has been formed at Charlotte with Charles M. Pritchett as temporary chairman and Adlai Osborn as temporary secretary.

It is the purpose of the organization to conduct an educational campaign for municipalities contemplating public improvement work and to assist them by information which the association will assemble and distribute. The contractors say that all over the South towns and cities are preparing to expend millions of dollars for improvements, based on estimates of whose accuracy they have no guarantee. It is planned to provide such places with the very latest information obtainable on technical subjects, such as paving, piping, waterworks systems, and sewerage. The city officials will be brought into touch with the results of the latest experiments with different materials and with the views of experts as to the most desirable materials for given purposes.

The following is the program for the meeting:

Dr. Charles A. Bland, mayor of Charlotte, address of welcome.

F. M. Laxton of Charlotte will state the object of the meeting.

J. L. Ludlow of Winston-Salem, "The Development of Municipal Engineering in the South."

Gilbert C. White, "The Relation of This Organization to Engineers."

J. R. Purser, "The Relation of This Organization to the Manufacturer of Apparatus and Materials."

J. E. Sirrene of Greenville, S. C., "Engineering From the Purchaser Viewpoint."

A. D. O'Brien of Wilmington, "The Relation of This Organization to the General Contractor."

J. B. McCrary of Atlanta, Ga., "The Financing of Municipal Improvement Bonds."

Vermont Society of Engineers.

The second annual meeting of the society was held at Hotel Vermont, Burlington, March 12, 1914. The morning session was given to reports of officers, standing committees, and the election of officers.

The Secretary's report showed a substantial gain in membership, and was an evidence of marked activity. The Committee on Public Policy reported in the form of a recommendation that it should be a matter of policy for the society to take such steps as necessary in order to lay before the Governor of the state the matter of appointment of at least one engineer on the Public Service Commission. They also recommended that the officer of State Engineer be created, that the society appoint a committee to take this matter under advisement and act for the society. After much discussion which showed the advantages to the state, these two recommendations were adopted by the society.

The Committee on Highways made a progress report on concrete roads, and a very interesting discussion followed. The Committee on Water Power and Manufacturing Industries made it clear that we should endeavor to increase the number of small plants and thereby enlarge returns to the individual and the state.

The election of officers was announced as follows: President, D. Williams, Saint Johnsbury; Vice-President, H. M. McIntosh, Burlington; Secretary, G. A. Reed, Barre; Treasurer, A. E. Winslow, Northfield; Director, C. F. Purinton, Burlington.

At the afternoon meeting the state forester, Mr. A. F. Hawes, read an excellent paper on "The Influence of Forests on Water Storage and Stream Flow," and the local forecaster, Mr. J. K. Hooper, gave a very interesting paper on "Rainfall." These were followed by a paper on "Water Resources and Storage" by Prof. J. W. Votey.

Following a banquet which was well enjoyed by all present, the meeting was again called in the roof gardens. Prof. G. H. Perkins gave an interesting address on the "Geology of the Green Mountains." This was followed by the President's address, which brought out many lines of activity in which the society might well interest itself. After a social hour departure was taken and all pronounced the second annual meeting a success.

National Paving Brick Manufacturers' Association.

At the recent New Orleans convention the question of paving brick specifications was discussed. A resolution was passed declaring in favor of a standard specification that would be uniform throughout the United States. A committee was appointed to confer with the American Society for Standardization of Paving Materials and other municipal and engineering bodies, with the idea of reaching some definite conclusions. While the association believes its No. 1 specifications are the best to be had, it realizes the fact that certain concessions may be made without causing any serious trouble, and is manifesting a desire to meet with committees from the other organizations and effect a compromise. The committee to conduct the revision is composed of Will P. Blair, H. S. Renkert, W. T. Blackburn, Eben Rodgers and C. C. Blair. The committee will call for suggestions from every paving block manufacturer in the country, and also confer with college institutions, road builders and other interested persons.

The Municipal Engineers of the City of New York.

At the regular meeting of the Society in the Engineering Society's Building, 29 West 39th street, New York City, Nicholas S. Hill, consulting engineer, New York City, will pre-

sent a paper on "The Valuation of Public Utilities." The paper will be illustrated by lantern slindes.

A combined inspection trip by the Municipal Engineers of the city of New York and the Brooklyn Engineers' Club has been arranged for Saturday, March 28, at 2 p. m., to the automobile works of the Ford Motor Company, at Jackson avenue and Honeywell street, Long Island City.

The inspection committee consists of Edward M. Law, chairman; Daniel B. Goodsell, Edwin H. Thomes, Josiah A. Briggs, Jr., and Kenneth B. Emerson. George A. Taber is secretary of the society.

American Highway Association.

Reports forwarded to the headquarters of the American Highway Association from the Government scouting party which is blazing a modern trail from Washington, D. C., to Atlanta, Georgia, show that the proposed maintenance of route under scientific government management has struck a responsive chord.

Because of the enthusiastic way in which the Government's experiment is being received, it is very likely that other sections of the country will ask the assistance of the Office of Public Roads in supervising the maintenance of important highways.

The state and county officials along the highway from Washington to Atlanta are arranging to provide an adequate supply of labor for continuous maintenance and patrol of the highways under the direction of the government engineers who are to be assigned to the work, and in order that there may be harmonious and uniform methods along the entire route.

The scouting party consists of Captain P. St. J. Wilson, assistant director of the U. S. Office of Public Roads; Leonard Tufts, chairman of the Maintenance Committee of the American Highway Association; George P. Coleman, State Highway Commissioner of Virginia; Dr. Joseph Hyde Pratt, State Geologist of North Carolina; Preston Belvin, president, State Automobile Association of Virginia; Col. Benneham Cameron, of Stageville, North Carolina; George C. Scales, W. L. Spoon and D. H. Winslow, highway engineers of the U. S. Office of Public Roads.

According to reports which have been filed at headquarters of the American Highway Association, which inaugurated the plan, the scouting party was joined at Cheraw by E. J. Watson, Commissioner of Agriculture of South Carolina, and at Augusta by S. W. McCallie, State Geologist.

In each county the local authorities proceeded with the Government scouting party, the American Highway Association being represented from Pinehurst, N. C., by Charles P. Light, Field Secretary of the American Highway Association. The American Road Congress, which combines the conventions of the American Highway Association and its subsidiary organizations, as well as the convention of the American Automobile Association, is to be held at Atlanta, Georgia, during the week of November 9. The reports sent to Washington by the party from various points show much better road conditions than were expected at this season. It was intended for a time to start the trip when the roads would be in better condition, but it was finally decided that it would be best for the party to see the highways when they are at their worst, in order to know what improvements are needed.

Illuminating Engineering Society.

At the meeting of the Chicago section, March 11, 8 p. m., in the Western Society of Engineers' auditorium, 17th floor, Monadnock Block, papers on "Home Lighting by Gas and Electricity" were presented by Philip Polacheck, Milwaukee, and C. A. Luther, Chicago.

At a joint meeting of the I. E. S. and other engineering societies at Republican House, Milwaukee, March 21, A. J. Sweet presented a paper on "Principles of Street Lighting."

National Association of Park Superintendents.

Plans for the entertainment of delegates to the annual convention of the National Association of Park Superintendents which takes place in this city next August were materially advanced at a meeting of the Executive Committee held in New York last week. In fact, the program was completed in so far as New York City's part in the affair is concerned. The superintendents will visit the metropolis after their convention ends in Newburgh.

Present at the meeting which was held in the Arsenal at 2 o'clock, were Chairman Herman Merkle, Superintendent of the zoological gardens, New York City; Superintendent Beattie of the Manhattan Parks; Wm. J. Zartman, superintendent of the Brooklyn parks; Park Commissioner William H. Coldwell of Newburgh, and others.

The superintendents will convene in Newburgh on Monday, August 24. There will be a business meeting in the afternoon and in the evening addresses by well known authorities on landscape gardening will be listened to.

On Tuesday the day will be devoted to sightseeing. The former homes of Andrew and Charles Downing, the fathers of landscape gardening in this country, will be visited. The former lived in the old homestead since known as the Carson property, extending between Grand and Liberty streets, north of Broad. The erstwhile home of Charles Downing is now the residence of General Smith at Balmville.

In the afternoon the visitors will be taken in automobiles to Tuxedo Park, and on their return in the evening a banquet will be tendered them.

The following morning they will be taken to New York on the Mary Powell, which will be specially chartered for the occasion, visiting West Point on the way down the river.

On the morning of Thursday, August 27, the superintendents will be taken in charge by the officials representing the City of New York, whose guests they will be. They will be met at the Hotel Astor at 9 o'clock and taken for a drive through Central Park, Riverside Drive, the Bronx and other parks. Lunch will be served at the zoological gardens in the Bronx. The visitors will then be driven down the East Side through several smaller parks and playgrounds, and through Mulberry Bend and Chinatown. Thence the route will be over the Manhattan Bridge to Prospect Park, to Coney Island, where an elaborate banquet will be served at Feltman's.

The superintendents will be the guests of the city of Newburgh until their arrival in New York on the Powell, at which time the local entertainment committee will be supplanted by a committee from the metropolis.

In selecting Newburgh as the place for holding the convention, the superintendents paid that city signal honor. Never before have they assembled in so small a city, their conventions being usually held in such cities as Boston, Seattle, Washington, Denver, etc. Next year the convention will be held in San Francisco. New Orleans and Cincinnati were both competitors of this city for the honor of entertaining them this year.

It is expected that about 150 men will be present, representing cities from all parts of the United States.

Township Supervisors of Butler County, Pa.

The first meeting of township supervisors, as provided for under the Pennsylvania acts of July 22, 1913, and May 8, 1913, relating to the formation and conduct of an association of officials in charge of the construction and maintenance of public roads, was held in Butler, Pa., March 25. The law provides that all township supervisors who attend shall be paid $2 per day with mileage at the rate of three cents a mile. In organizing each county association there is elected a president, two vice-presidents, a secretary and treasurer. The mayor of any city or burgess of any borough or their representatives, county commissioners and county court judges are eligible to membership in the association, and are permitted to hold office, but are not entitled to vote. Each county association is permitted to expend $125 for convention purposes, which sum is obtained from the county treasurer.

W. A. Wynn, maintenance engineer of the bureau of township highways of the state department, attended and represented the department. H. W. Claybaugh, assistant engineer of the State Highway Department, in charge of the district of which Butler county is a part, attended the meeting, as did C. C. Ferguson, county superintendent of Butler county. These meetings are primarily intended to gather together in each county all persons who are interested in the subject of good roads and highway improvement, and are to constitute the first steps in the formation of permanent associations in each county for the friends of the good roads movement.

NEW APPLIANCES

EAGLE METER BOX.

Has Cast Iron Cover and Sections—Brass Locking Bolt.

The Eagle Machine and Foundry Co., Hope, Ark., manufacture a sectional box for housing water meters. The first order of boxes was made on a special order from the local waterworks. This box, made from the original drawings, met with so much success that waterworks officials of neighboring cities heard about them and gave orders which now tax the capacity of the foundry to fill.

The meter dial stands within six inches of the top of the box. The box and cover are made of selected gray iron. The locking bolt is of brass. When key is inserted and turned one-quarter it is securely held in the recess and answers as a handle with which to remove the cover. It cannot be removed until the cover is replaced and locked. Describing the locking device more in detail, a brass five sided bolt is mechanically fitted so that the head is below the surface and rests within a recess that will just admit the special key and is further protected by a little lug which makes it impossible to turn it with any but the special wrench.

The meter box is made in three sizes of bodies, six, nine and twelve inches deep. Each section fits snugly into the cover recess, thus accommodating any depth of service pipe. The inside measurements of the body are eleven inches wide and seventeen inches long.

DIESEL OIL ENGINES.

Cylinder Wear Minimized by Use of Swedish Iron Cylinders and Swedish Design Throughout.

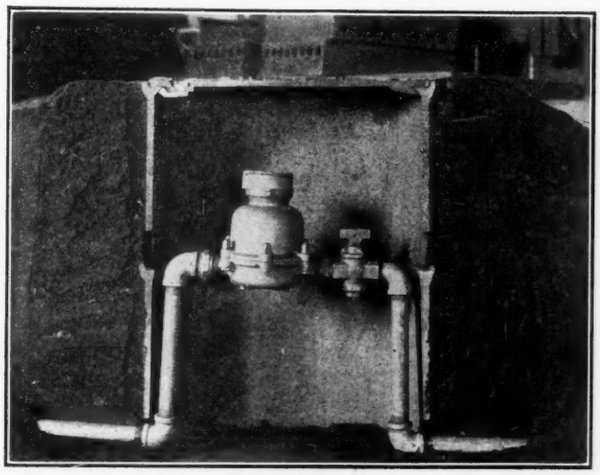
McIntosh & Seymour Corporation, Auburn, N. Y., are placing on the market Diesel oil engines of various design. The Type A four-cycle stationary engine is suitable for the use of municipal lighting and other power plants where units of from about 200 to 500 brake horsepower capacity are needed.

These engines are built without change from the designs of the Swedish Diesel Engine Company. One of the chief distinguishing characteristics of the Diesel engines produced by the Swedish company has been the remarkable freedom from cylinder wear, together with very low consumption of cylinder lubricating oil. The McIntosh & Seymour Corporation will have the castings for the working barrels, cylinder heads, pistons, rings, and a few other cylinder details made in Sweden.

The Type A stationary engines, as will be seen by reference to the cut, have individual frames for each cylinder, with a multiple stage air compressor for the fuel injection, driven directly from a crank on the end of the main shaft.

The ratings in brake horsepower are the continuous load capacities of the engines, which will have a momentary overload capacity of 20 per cent above the rating.

When arranged for belt or other mechanical drive, the 4-A-38 develops brake horsepower of 400 to 500 at 135 and 170 revolutions per minute, respectively. Arranged for direct-current electric generators, this engine is rated at 505 brake horsepower, 350 k.w., 165 revolutions per minute. Arranged for 60-cycle, A. C. electric generator, the brake horsepower is 505, the actual k.w. of the generator being 350, number of poles 44, revolutions per minute 164.



EAGLE METER BOX.

BOILER EFFICIENCY METER.

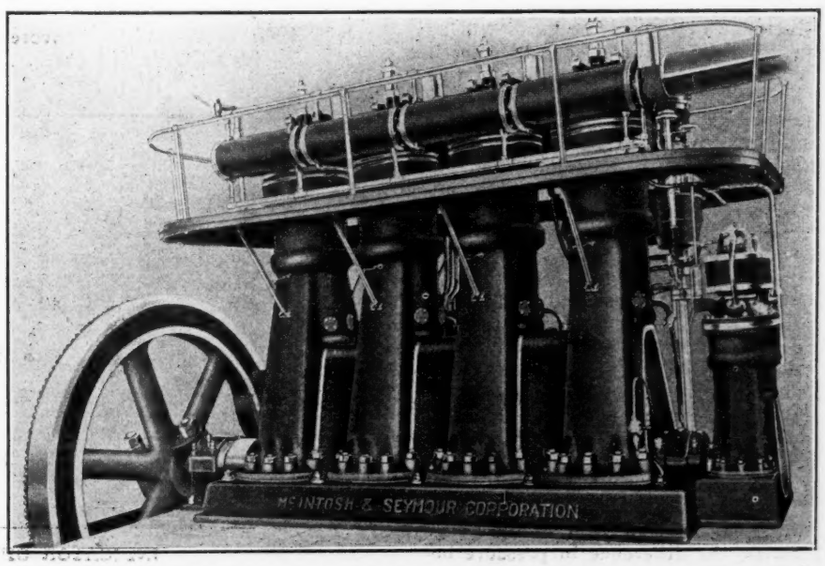
W. A. Blonck, consulting engineer, of Chicago, Ill., has invented what he terms a "boiler efficiency meter," a convenient combination of gauges, giving the fireman definite information of furnace and load conditions.

Uncertainty as to the exact condition of the fire in the furnace has made firing a boiler an art which can be attained only through practice under the guidance of one who is a master of the art.

An instrument which indicates the instantaneous changes not only in the furnace but in steaming capacity has long been sought as a guide for firemen and is at last available.

As will be noted by the illustration, the Blonck meter is a combination of two sensitive draft gauges, one connected between the atmosphere and the furnace and one connected between the furnace and breeching on the boiler side of the damper. The lower one, filled with red oil, gives a relative indication of the pressure with which the air rushes into the furnace or the resistance of the fuel bed, while the upper gauges, filled with blue oil, give a relative measure of the amount of combustion gases passing the boiler proper.

In addition to the two gauges, the meter is provided with two sliding scales (see Fig. 1) which are to be adjusted to the best and most efficient operating condition of the particular boiler; the instrument should be mounted on the boiler front, so that firemen,

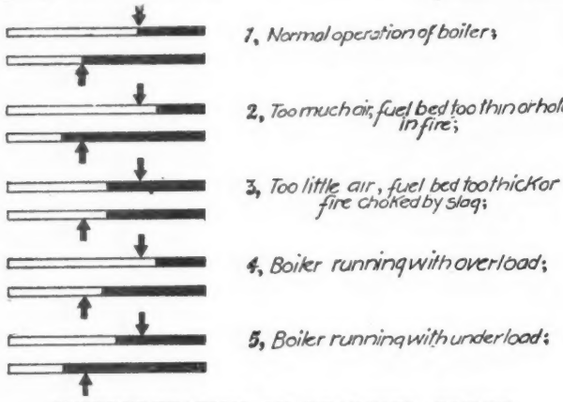


FOUR-CYLINDER DIESEL INTERNAL COMBUSTION ENGINE.

chief engineer and owner can see at a glance the working conditions of each boiler.

It is known that a draft gauge indicates a difference in static pressure. As gases in the chimney are lighter, there is a tendency for the gases to rise, being pushed up by the air beneath. If there were no resistance to the air through the ashpit door, grate and fuel bed, the pressure in the furnace would be the same as the atmosphere, so far as we are capable of measuring it.

As a matter of fact, however, these do offer a resistance, and the greater their resistance the greater will be the difference in pressure between the furnace and atmosphere and the higher will be the gauge reading; in other words, the thicker the fuel bed or the more the grate is clogged with clinkers, the higher will be the draft gauge reading; or, if the resistance is reduced by holes developed in the fuel, more air will pass into the furnace and the draft gauge will read lower.


1, Normal operation of boiler;
2, Too much air, fuel bed too thin or holes in fire;
3, Too little air, fuel bed too thick or fire choked by slag;
4, Boiler running with overload;
5, Boiler running with underload;

INTERPRETATION OF READINGS—BOILER EFFICIENCY METER.

Suppose that the draft gauge gives a low reading. It would naturally be expected that a great amount of air is passing through the furnace. This excess of air may produce complete combustion, but at the same time reduce the temperature; and since there is more oxygen in the air than can be taken up by the carbon in the fuel the percentage of CO_2 in the gases will be low. Going to the other extreme, if the furnace gauge reads high and this indicates that the resistance through the fuel bed is great and little air is passing, the result is a lack of air supply and sufficient oxygen does not reach the coal to cause complete combustion, and an analysis of the flue gases shows carbon monoxide. Between these two extremes is the point where just enough air passes through the fuel to cause complete combustion without reducing the temperature of the gases; so, for normal operation, this medium gauge reading should be carried.

From the above it will be seen that any slight change in the fuel bed will be indicated by a change in the reading of the furnace draft gauge.

Taking up a similar discussion of the differential draft gauge, i. e., the gauge showing the difference in pressure between the furnace and the damper, we find that changes in the amount of air furnished the fuel affect it oppositely to that of the furnace draft. For instance, too much air causes greater resistance through the tubes and a higher differential gauge reading; too little air passing offers little resistance and a low gauge reading. For normal operation there is, therefore, as in the boiler case, a medium gauge reading which should be maintained.

Taking abnormal conditions, an overload on the boiler requires more gases to go through the tubes, with consequent higher resistance and higher differential gauge readings. An underload will have the reverse effect on the gauge.

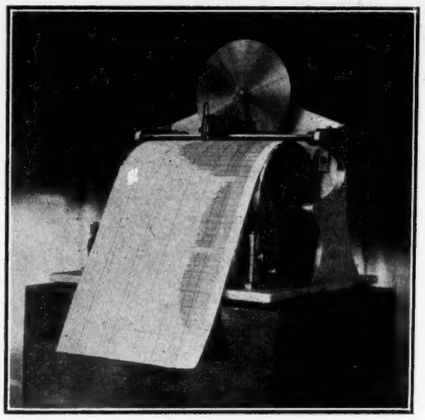
By placing the gauges together, as is done in the Blonck meter, the relation between the readings can easily be observed and a slight change in the operating conditions of the boiler can be noted and normal conditions restored before serious waste can take place. The five positions shown in Fig. 2 are those most commonly noted, though others, such as dirty flues or a fallen baffle, are just as readily and instantly shown by the meter.

When installed on boilers in batteries, the meter is of further value in keeping the boilers evenly loaded.

The connections between the instrument, furnace and boiler side of damper consist of standard ⅛-inch steel piping.

The procedure for adjusting the instrument to the most efficient operation of the boiler should take place while the boiler runs with a steaming capacity equivalent to the longest period of average load; then the following three conditions taking place simultaneously will give the best economical results:

(a) Will fire with fully covered grate, giving high CO_2 in flue gases.



ELECTRICAL RECORDING MANOMETER.

(b) Low draft over the fire, or low red gauge.

(c) Larger pressure drop between fire and damper, showing maximum amount of combustion gases, or high blue gauge.

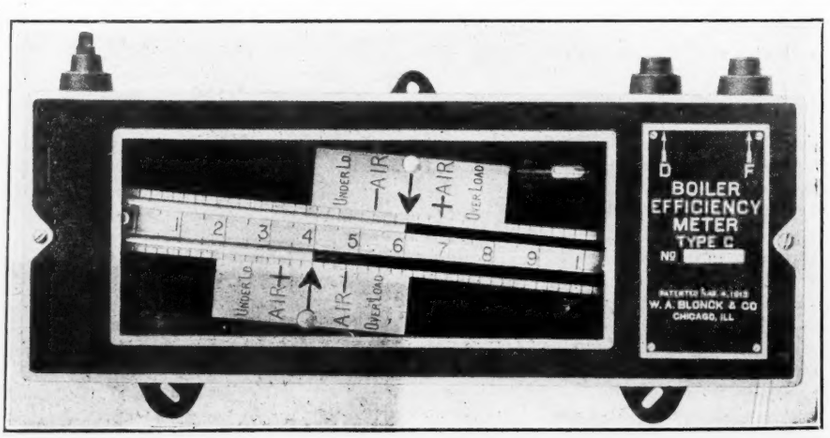
In order to prove the adjustment, a number of tests should be made by taking simultaneous observations of the Blonck boiler efficiency meter and flue gas samples.

Lanham Electrical Recording Manometer for Waste Water Surveys With Pitot Tubes.

By PAUL LANHAM, Inventor and Manufacturer.

This recording instrument was designed to fill the need for a satisfactory recording and indicating mechanism to be used by the pitometer operators in their subdivision tests of water mains. Throughout the six years that I have been in charge of the pitometer surveys in Washington, D. C., I have desired to have graphic records of the night tests, instead of the written notes of the party chiefs, so as to eliminate the personal element in the interpretation of the pitometer readings. As there was no instrument on the market which exactly filled this position, experiments were made, resulting in the instrument which I will describe.

The extremely delicate forces which



INDICATOR OF BLONCK METER.

must be measured in pitometer work made it very difficult to secure a self-recording aparatus, and for many years the only successful recorder was one using photographic means. In the Lanham Recorder, however, this trouble has been completely overcome by using a very small water or electric motor to furnish all power necessary to move the recording pen, drum, etc., and control the movement of the former by an electrical contact within a small mercury manometer.

The construction of the instrument is such that the pen moves back and forth across the record sheet in synchronism with the movement of a sharp platinum point within the manometer. The pen point is normally held from contact with the paper by an electro-magnet, which is released by the breaking of an electric circuit when the platinum point is withdrawn from the mercury. This results in a chart composed of a series of lines or ordinates whose length is proportional to the height of the mercury. Special devices keep the pen from marking the paper except during the upward stroke. The electric circuit is a simple make and break circuit, and operates on a very small battery. The instrument needs no comparison with any other device to determine its accuracy, as a glance at the mercury column and pen will show that the record is being properly made.

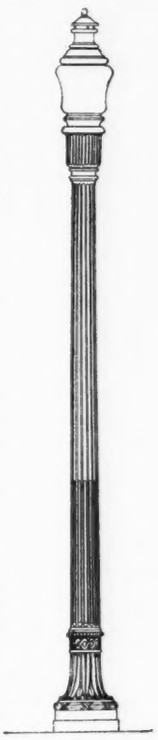
As the forces which move the mechanism are derived from an outside source, no load is placed upon the mercury column to prevent its free response to the smallest pressures from the pitot tube, and, at the same time, all moving parts can be substantially made without interfering with the accuracy. The recorders are made of aluminum and brass, finished all over and lacquered. There is on handsomer recorder made, and the accuracy is unequalled. Its weight is about thirty pounds.

ROCHESTER LAMP POST.

The Elmer P. Morris Iron Works of 136 Liberty street, city, representing the Central Foundry Company, has quite recently supplied to the city of Rochester, New York, several hundred cast iron ornamental lamp posts for use in their new "White Way" work. These are for use with General Electric Luminous Arc Lamps and are of handsome and dignified design.

We illustrate here a line drawing of the design selected for use in this work.

Fifty of these poles have also been ordered for use at Hamlin, Ind., and the wide distribution of this style of unit seems to indicate that it has considerable popularity.



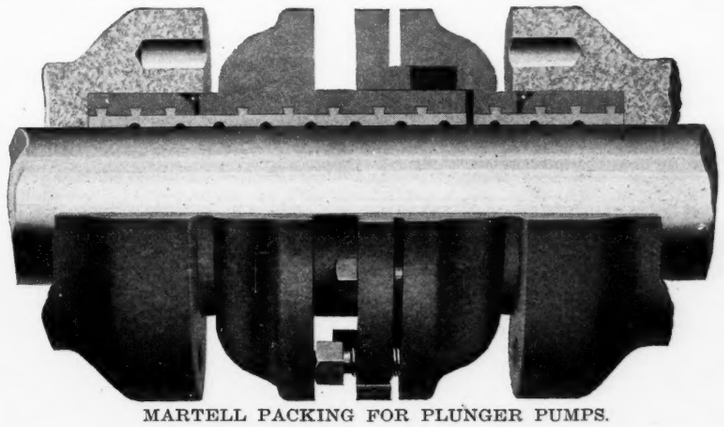
The center of the globe of these posts is located 14½ feet above the sidewalk line; the diameter of the pole at the base is 18 inches.

Municipalities and Central Electric Stations throughout the country have used the luminous arc very widely in connection with poles of this type for the illumination of the main thoroughfares and during the coming summer there is no doubt but that cities that have equipped themselves with improved lighting standards during the spring months, will reap the benefit in attracting greater numbers of permanent and transient residents to their cities.

MARTELL PUMP PACKING.

Imposes Film of Water Between Moving Surfaces, Reducing Friction to Minimum.

The Metallic Packing and Manufacturing Company, Elyria, O., have placed on the market a metallic packing for use in outside center packed plunger pumps which is claimed to increase the efficiency of a pump by a very large per cent. Progressive engineers have been paying close attention to the matter of friction in all power plant machinery, and it has been found that one of the worst offenders in this line is the pump packed with fibrous material, some tests having shown that it takes as much power to push the plunger through the fibrous material as it does to raise the required amount of water.



MARTELL PACKING FOR PLUNGER PUMPS.

The Martell Hydraulic Metal Packing is a sleeve or bushing of the finest babbitt metal, which is so designed that a film of fluid is constantly interposed between this sleeve and the plunger and yet is unable to pass completely owing to the numerous reversing rings which turn the flow of fluid back on itself. This packing, it is stated, will make a high pressure hydraulic pump the cleanest and quietest machine in the plant. In eliminating the friction the Martell packing steadies the action of the pump. The material is claimed to effect a saving in three ways. The packing itself lasts longer. The labor of frequent repackings is saved. Power, claimed to be one-sixth of that used, is saved. On the basis of $30 per horse power year, for a large pump, the total is an amount well worth considering.

POLYCASE GLASS.

To retain a customer over a period of sixty years is an achievement of which any firm might well be proud. And when that customer is the great city of New York, the metropolis of the country, there is additional cause for wonder.

Since the middle of the last century the Gleason-Tiebout Glass Company and their predecessors have been supplying the great bulk of the lighting glass ware used on the many hundreds of miles of streets and boulevards to be found within the confines of Greater New York.

Time has brought many changes. At first, most of the lighting was done by means of oil lamps on which very ordinary lighting glassware was all that was necessary. Later on gas lighting came into vogue, and it became necessary to furnish glass of a much higher quality than that used on the oil lamps.

At a still later date the electric lamp came into everyday use, bringing with it many new and complicated problems for the glass manufacturer. After many experiments the Gleason-Tiebout Glass Company finally developed their Polycase glass for this class of lighting. The new glass met with instant approval, and both became known throughout the country as the most efficient diffusing glassware on the market.

Polycase is "cased," which means it is composed of several layers of different glasses, the result of this combination being that the rays of the electric lamp are diffused and scattered all over the enclosing glassware so that the glass itself appears to become the source of light. As a result, when Polycase glass is used there is no objectionable bright spot in the center as is the case when ordinary roughed inside glass is used.

Polycase glass became so popular throughout the country that the Gleason-Tiebout Glass Company found it advisable to extend the uses of this glassware to the manufacture of many

special shaped bowls and urns for semi-indirect lighting. In the new forty-story Municipal Building, recently erected in New York City, over six hundred twenty-inch Polycase urns are included in the lighting equipment. Many other similar high-grade structures, not only in the United States but in all parts of the world, are lighted by means of this glassware.

Opalux Reflectors.—The Opalux Company, of New York City, is having remarkable success in having its reflectors adopted by many cities throughout the country for use in lighting school rooms, for which class of work they are peculiarly well adapted.

Opalux reflectors are highly efficient—practically 80 per cent of the light is reflected downward at a useful angle. When used with bowl frosted Mazda lamps there is absolutely no glare, as the inner surface of the reflector is depolished. The body of the reflector is made of a glass that is sufficiently dense to prevent any of the light striking into the eyes. In addition, Opalux glassware is of a special color, selected for its beauty and for its beneficial effects not only upon the eyes, but upon the temper and disposition of the students as well.

Several of the leading colleges of the country, such as Yale, Vassar, Columbia, etc., have adopted the Opalux reflector for school-room illumination—this after the most exhaustive tests had been made to determine the best possible method of lighting class rooms.

NEW IMPROVED MAZDA.

An Incandescent Lamp for Lighting Large Areas.

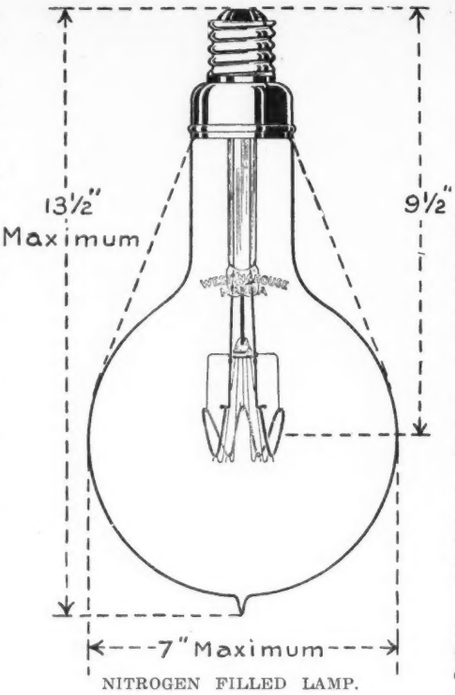
For a long time there has been a demand for an incandescent lamp of high candle power. Those who wanted the simplicity and reliability of the incandescent system have in many cases refrained from using it because of its relatively low efficiency when compared with large units of other systems.

The Westinghouse Lamp Company has just put on the market an improved Mazda lamp which will meet this demand and fulfill all its requirements. This lamp operates at an efficiency of approximately .6 watts per candle power—which is 33 per cent. higher than any efficiency ever before obtained in a commercial incandescent lamp for standard lighting circuits.

The filament in the lamp consists of a closely coiled tungsten wire supported by anchors as shown in the illustration. The lamps are made in 750 and 1000 watt sizes for 100 to 130 volt circuits; the 750 watt giving approximately 1100 candle power and the 1000 watt approximately 1650 candle power.

The color of the light given by these new Westinghouse Mazdas is superior to that given by any other form of incandescent lamp. It approaches sunlight more closely than the regular Mazda Lamp.

The lamps can be operated on direct or alternating current circuits of any frequency in commercial use to-day.



NITROGEN FILLED LAMP.

On account of the intense brilliancy of the filament, it is desirable that the lamps be used with some kind of diffusing reflector, and they are ideal lamps for indirect or semi-direct lighting.

Trial installations of these Improved Westinghouse Mazda Lamps have proved conclusively that the lamps are perfectly reliable and that satisfactory life and service can be guaranteed.

It is expected that these lamps will be used extensively in mills, factories, office buildings and hotels, railroad stations, shops and yards.

The Westinghouse Lamp Company has issued a bulletin giving full information in regard to the new units.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago. Quotations: 4-inch, $26; 6 to 12-inch, $24; 16-inch and up, $23.50. Birmingham. Stocks are not accumulating. Prices are not maintained in all cases. Quotations: 4-inch, $22; 6-inch and up, $20. San Francisco—General business from corporations continues to improve and several new municipal inquiries have appeared. New York—Pipe manufacturers are competing sharply on all public lettings. There are a large number of small inquiries from private buyers. Quotations: 6-inch, car loads, $22 to $23.

Lead.—Market is dull but firm. Quotations: New York 4c; St. Louis 3.90c.

General Electric Bulletin. — Among the recent bulletins of interest in the municipal field are the following: No. 45601, aluminum lightning arresters for alternating current circuits. No. A 4200, steam insulators and clamps suitable for insulating and supporting power house wiring and overhead distributing cables and wires. No. 44590, Type ML governor for motor driven air compressors. No. 47,400, Type F, form K12 oil switches.

BELL TELEPHONE SYSTEM.

Interesting Data From Annual Report of American Telephone and Telegraph Company.

During the past year subscribers' telephone stations have increased until now there are 8,133,017, a gain of 676,943. These stations reach 70,000 localities or 10,000 more than the number of post offices. The total wire mileage is 16,111,011, of which 92 per cent. is copper.

More than half the wire mileage is underground, the total underground plant representing a cost of $181,500,000.

The number of daily telephone connections showed a growth of nearly two million, reaching an average of 27,237,000 a day. Europe has only two-fifths of the telephone traffic of the United States.

The extension of the telephone plant during the year amounted to $54,871,856, making a total for fourteen years of $646,915,200. According to present estimates the construction for the current year will cost in the neighborhood of $56,000,000, of which the local resources of the companies will supply $25,000,000. A steady improvement of service has been achieved.

The report says:

The gross revenue in 1913 of the Bell System—not including the connected independent companies—was $215,600,000; an increase of over $16,000,000 over last year. Of this, operation consumed $75,400,000; taxes, $11,300,000, or 1½% on the outstanding capital obligations; current maintenance, $32,500,000; and provision for depreciation, $37,700,000.

The surplus available for chages, etc., was $58,700,000, of which $16,700,000 was paid in interest and over $30,300,000 was paid in dividends.

The total capitalization, including inter-company items and duplications but excluding reacquired securities of the companies of the Bell System, is $1.390,242,470. Of this $620,127,086 is owned and in the treasury of the companies of the Bell System. The capital stock, bonds and notes payable outstanding in the hands of the public at the close of the year were $770,115,384. If to this be added the current accounts payable, $26,471,681, the total outstanding obligations of every kind were $796,587,065 as against which there were liquid assets, cash and current accounts receivable, of $72,237,885, leaving $724,349,180 as the net permanent capital obligations of the whole system outstanding in the hands of the public.

We believe that the valuation by the Interstate Commerce Commission when completed will confirm our repeated statements that the true value of our telephone plans is much greater than the book value.

In the case of the associated companies, excluding the American Telephone and Telegraph Company, particular attention is called to the per cent. of net earnings and of dividend and interest disbursements to total plant and other assets:

Net earnings to plant and other assets	5.69%
Dividends and interest to plant and other assets	4.92%

In other words, the property employed earned less than 6 per cent. per annum, and the dividends and interest paid were less than 5 per cent upon the value of the property, which could not be considered unreasonable.

Taken by itself, the American Telephone and Telegraph Company shows net earnings of $40,576,746.19, an increase of $2,669,101.93 over 1912. The total outstanding capital stock and bonds were $504,207,300, which represents payments into the treasury of over $24,500,000 more than the par value of the capital obligations.

The number of shareholders, 55,983, showed an increase of 5,686 during the year.

The engineering evolution of the telephone which has been accomplished by the engineers, is reviewed with special reference to the marked improvement of telephone exchange equipment and methods of operation, and the extension of transmission in the underground circuits between Boston and Washington, and in the work of connecting the Atlantic and the Pacific for telephone communication. At headquarters the Bell System has a force of 550 engineers and scientists, a staff unequalled in the world, wholly engaged on studies of these subjects.

The report shows that under the pensions, disability benefits and insurance plan, in 16,054 cases employees of the Bell companies had participated in the benefits and the payments have aggregated over one million dollars.

Action of Sea Water on Wrought Iron Pipe.—There are municipal purposes for which salt water could be used, and is not used through fear of corrosion. Among those possible uses may be mentioned auxiliary fire lines and mains for providing water for flushing streets. A recent experience that has come to light in Atlantic City shows that fear of corrosion of pipe need not prevent the use of salt water wherever it is available. A suction line drawing water from the ocean was installed fourteen years ago, to supply the Columbia pools with sea water. Byers' Wrought Iron Pipe was used for this line, and for fourteen years gave no trouble whatsoever. Last summer the baths were greatly enlarged, and it was necessary to replace the suction line with a much larger diameter. The original lengths of Byers' Pipe, laid fourteen years ago, were found to be in prime condition, having lost very little from corrosion, despite the fact that they were exposed to both inside and outside action. This pipe was so good that it was laid again in another part of the work for another purpose. An even more severe test was found to have operated on a heating system of Byers' two-inch pipe, galvanized. This system was laid fourteen years ago, with the suction line referred to above, and when the extensive alterations to the plant last summer caused it to be taken up, it was found to be in almost perfect condition, and was replaced with no repairs whatever.

American and New Niagara Water Meters.—The Buffalo Meter Company, 290 Terrace, Buffalo, N. Y., has issued a new edition of their catalogue in five sections. The first section describes and illustrates the working part of the American and New Niagara water meters. The second deals with accessories made by the company, including, extension dial curb boxes, manhole rings and covers, vertical connections, lock boxes, meter books, etc. Section three contains letters from water works officials regarding their experience with the meter, their observations on its accuracy and endurance. Section four deals with the general questions of the advantages derived from the use of water meters. The last section contains a model set of water meter specifications.

Electric Pumping.—The Red Wing Gas, Light & Power Company has contracted for the city pumping at Red Wing, Minn. The pump installed will supply approximately 2,000,000 gal. of water a day.

Combustion Appliances.—Stephen H. Payne, 30 Church street, New York City, is the agent for the Blonck Boiler Efficiency Meter described on another page. Mr. Payne is also agent for the Thwing Instrument Co., of 445 North Fifth street, Philadelphia, Pa., makers of recording and other pyrometers. He is also agent for the Combustion Appliances Co., Rogers Park, Chicago, Ill., manufacturers of the Hays draft analyzer, differential draft gauge, and gas collector.

Cleaning Water Mains.—The National Water Main Cleaning Company, 61 Park Row, New York City, have recently taken contracts for water main cleaning at Annapolis, Md., and Atchison, Kan. They are at present carrying on contracts at North Baltimore, O., Salt Lake City, Utah, and Selma, Ala.

Pumps.—The Laursen Automatic Pump Company, Eau Claire, Wis., plans to add the manufacture of special city water and high lift pumps embodying a new patented system of packing. The company is enjoying a heavy run of business.

Contractors' Tools.—At the annual meeting of the stockholders of the Kilbourne & Jacobs Mfg. Company, Columbus, O., the following officers were re-elected: President, Col. Jas. Kilbourne; vice-president, F. A. Jacobs; general manager, James R. Kilbourne; treasurer, F. C. Eaton; auditor, Joseph D. Potter; secretary, Lincoln Kilbourne; assistant secretary, Clyde Roth. In his annual address, President Kilbourne stated that prospects for the current year's business are unusually promising. The company recently made large additions to its plant which are now in operation.

Municipal Purchase of Electricity.—The Minnesota-Wisconsin Power Corporation, a subsidiary of the American Public Utilities Company, of Grand Rapids, Mich., has closed a contract with the municipality of Lake City, Minn., for furnishing the local municipal plant with energy for light and motor service. The Minnesota-Wisconsin Power Corporation has also completed arrangements to furnish the towns of Prescott and Hastings, Minn., with electricity.

PERSONALS

Bensel, John A., New York State Engineer, Albany, N. Y., on March 19 delivered an illustrated lecture on "Relative Cost of Transportation by Waterways, Railways and Highways" before the graduate students in highway engineering at Columbia University.

Callan, Luke H., Bristol, R. I., has been elected highway surveyor.

Davis, James L., Bennington, Vt., has been appointed highway engineer of Bennington county.

Ellsworth, R. M., Bowling Green, O., has been appointed chief of police by Mayor Wolfe.

Ferguson, John W., Hagerstown, Md., has been elected burgess.

Fortier, Dr. G. M. A., has been elected mayor of Little Falls, Minn.

Hill, Henry F., Augusta, Me., has been appointed street engineer; Warren D. Trask and Daniel A. Hewins, street commissioners.

Lent, David D., Batavia, N. Y., has been appointed village engineer and surveyor. F. W. Hart has been appointed superintendent of the municipal plant, Harley A. Bostwick, street superintendent, and Patrick Boyle chief of the fire department.

Martin, George A., Jr., Norfolk, Va., has been appointed county road engineer of Tazewell county. Mr. Martin is a graduate of the University of Virginia.

Miller, H. F., who for the past year has been associated with the advertising department of the Otis Elevator Company, and for four years previous to that with the Western Electric Company, has been appointed advertising manager of the Goulds Manufacturing Company of Seneca Falls, New York.

Pinkerton, P. W., Montrose, Cal., has been appointed city manager. Mr. Pinkerton is a graduate of the University of Chicago and is 27 years old.

Rossell, General W. T., has been appointed the first member of the consulting and advisory board of the New York State Highway Department.

Snow, F. Herbert, Harrisburg, Va., chief engineer of the State Department of Health since its organization, has been appointed chief engineer of the public service commission and will organize the engineering division of the commission. Mr. Snow is a graduate of Harvard 1890 and Massachusetts Institute of Technology. From 1890 to 1905 he was in general engineering practice for states, municipalities and corporations, including construction and rating propositions, among the work handled being the Boston grade crossing abolition, and drainage system. He was one of eight American and European engineers chosen in 1910 on the sewage system of New York. Mr. Snow has had charge of the technical side of the water purification and sewage work of the Boston Department of Health under Commissioner Dixon since 1905.

ADVANCE CONTRACT NEWS

ADVANCED INFORMATION
BIDS ASKED FOR

CONTRACTS AWARDED
ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			STREETS AND ROADS	
Ind.,	Marion	10 a.m., Mar. 28	Furnishing crushed stone and road oil	W. T. Patten, Co. Aud.
Ind.,	Indianapolis	Mar. 28	200,000 gals. road oil, and 400 carloads of crushed stone	City Clerk
O.,	Kent	Mar. 28	Brick paved driveway	R. Hecker, Eng. Cleveland.
Ind.,	Muncie	10 a.m., Mar. 28	Grading, graveling and macadamizing	Board Comrs.
Minn.,	Walker	2 p.m., Mar. 28	Clearing, grading, turnpiking, etc., 23.6 miles	I. H. Byhre, Co. Aud.
Pa.,	Sharpsville	Mar. 28	Grading and paving with brick, about 12,000 sq. yds	W. A. Graber, Boro. Sec.
Ill.,	Colinville	2 p.m., Mar. 28	11,925 sq. yds. vit. brick pavement on concrete	Board Local Imp.
Wash.,	Bellingham	1.30 p.m., Mar. 30	Improving permanent highway	County Comrs.
R. I.,	Providence	2 p.m., Mar. 30	Paving one street, sheet asphalt	Comr. Pub. Wks.
Kan.,	Ottawa	Mar. 30	Grading, curbing, guttering and paving	J. W. Hopkins, City Clk.
Minn.,	Blue Earth	Mar. 30	Grading, turnpiking and culverts	J. L. Herring, Co. Aud.
Mich.,	Highland Park	Mar. 30	Three miles sheet asphalt; reinforced concrete and brick asphalt; cost, $33,000	R. Milton Ford, Vil. Clk.
Wash.,	Humptulips	Mar. 30	Improving 7.8 miles highway	State Hwy. Bd., Olympia.
Ia.,	Atlantic	Mar. 30	Concrete paving, 50,000 sq. yds	E. Nicholas, City Clk.
O.,	Cleveland	noon, Mar. 30	Furnishing and delivering composite sand and gravel	A. R. Callow, Comr. Purchases & Supplies.
Cal.,	Sacramento	Mar. 30	Furnishing material and constructing roads in 7 counties	State Highway Commission.
Ill.,	Chicago	11 a.m., Mar. 30	Grading, paving and improving portion of streets	Board Local Imp.
W. Va.,	Charleston	10 a.m., Mar. 30	Road construction	County Comrs.
W. Va.,	Sissonville	10 a.m., Mar. 31	Road construction	County Comrs.
O.,	Ottawa	noon, Mar. 31	Furnishing material and constructing road	Co. Comrs.
O.,	Findlay	Mar. 31	Ten mi. waterbound macadam	A. R. Taylor, Engr.
Utah,	Salt Lake City	Mar. 31	20,000 sq. yds. asphalt, 25,000 Utah rock asphalt pavets and 16,000 lin. ft. concrete curb and gutter	N. Warrum, City Recorder.
Alta.,	Edmonton	Mar. 31	Paving, 1914	City Comrs.
N. Y.,	Buffalo	11 a.m., Mar. 31	Paving and repaving	F. G. Ward, Comr. Pub. Wks.
Md.,	Baltimore,	noon, Mar. 31	Five sections state highway, 16.69 miles	O. E. Weller, Chr. State Rds. Comn.
O.,	Wauseon	Mar. 31	Constructing county roads, about two miles	W. W. Ackerman, Co. Aud.
Utah,	Beaver City	Mar. 31	13,150 ft. cement sidewalks, 35,200 ft. paving	H. Ashworth, City Rec.
Ia.,	Algona	Mar. 31	Paving, 2 miles	City Clerk.
O.,	Sandusky	Mar. 31	Furnishing crushed stone to macadamize and repair streets	J. J. Molter, Dir. Pub. Serv.
Wash.,	Olympia	Apr. 1	4,373 sq. yds. bit. pavement on concrete	I. N. Holmes, City Clerk.
Ill.,	Springfield	noon Apr. 1	Cement for State Aid road construction during 1914	State Highway Commission.
N. J.,	Trenton	Apr. 1	Paving twelve streets; cost, $100,000	City Commission.
O.,	Cheviot	noon Apr. 1	Street improvement	A. J. Reusing, Clerk.
Wash.,	Mt. Vernon	Apr. 1	Constructing 3 miles of highway; cost, about $35,000	Co. Comrs.
Tenn.,	Nashville	Apr. 1	Paving with various materials	W. W. Southgate, City Engr.
Man.,	Emerson	Apr. 1	Constructing concrete sidewalk; cost, $7,000	W. W. Unsworth, Clk.
N. J.,	Elizabeth	Apr. 1	50,000 sq. yds. bituminous concrete pavement	City Clerk.
Ia.,	West Union	Apr. 1	28,000 sq. yds. paving, various materials	R. P. Camp, City Clk.
Pa.,	Bradford	Apr. 1	4,000 sq. yds. vit. pavement with curbs	B. A. Wise, City Engr.
N. Y.,	Elmira	Apr. 1	14,000 ft pavement, various materials	T. A. Brown, City Engr.
N. J.,	Plainfield	Apr. 2	Resurfacing and repaving streets	Council.
Pa.,	Pittsburgh	10 a.m., Apr. 2	Furnishing brick block, rock asphalt, sand, etc	R. J. Cunningham, Co. Control.
Pa.,	Swissvale	8 p.m., Apr. 2	Laying concrete sidewalks for year	W. F. Libbey, Sup. Pub. Wks.
O.,	Cincinnati	Apr. 3	Crushed stone road	County Comrs.
Mo.,	St. Louis	Apr. 3	Street improvements	Board Public Improvements.
Wash.,	Tacoma	Apr. 4	Concrete road construction, 4.26 miles	Co. Comrs.
N. D.,	Crafton	6 p.m., Apr. 4	Constructing sidewalks and crossing for the year	J. H. Johnson, City Aud.
Iowa,	Cresco	3 p.m., Apr. 4	24,000 sq. yds. cement paving, 15,500 ft. curbing	A. W. Gillet, City Clk.
Alta,	Banff	noon, Apr. 6	13,500 lineal feet, 20-inch diameter, steel pipe	Dept. Interior, Ottawa.
Minn.,	LeSueur	2 p.m., Apr. 6	16 road drags, 24 wheel scrapers and 4 road plows	J. H. Kaisett, Co. Aud.
Iowa,	Aimes	7.30 p.m., Apr. 6	Constructing and repairing sidewalks and crossings for the year	A. B. Maxwell, City Clk.
Miss.,	Greenwood	Apr. 6	Improving 21.5 miles post road	A. R. Bew, Clerk.
Wash.,	Ephrata	Apr. 6	Paving permanent highway; cost, $20,000	County Comrs.
Ind.,	South Bend	11 a.m., Apr. 6	One 10-ton road roller and one 20-bbl. sprinkling wagon	County Comrs.
Fla.,	Orlanda	2 p.m., Apr. 6	Furnishing five million paving blocks	G. R. Ramsey, City Engr.
O.,	Ottawa	noon Apr. 6	Furnishing road machinery	County Auditor.
Ind.,	Brownstown	2 p.m., Apr. 6	Roads in two townships	County Comrs.
Ind.,	Fowler	1 p.m., Apr. 6	Constructing various roads	Board Comrs.
Ind.,	Hartford City	2 p.m., Apr. 6	Road construction	Co. Comrs.
Minn.,	Minneapolis	11 a.m., Apr. 6	Grading and graveling	A. P. Erickson, Co. Aud.
Ind.,	Franklin	2 p.m., Apr. 6	Improving gravel road; cost, $12,005	Co. Comrs.
Miss.,	Hattiesburg	Apr. 6	Furnishing material, grading, surfacing and bridging, about 9 miles	J. H. Denham, Sec. Hy. Comn.
N. D.,	Bowman	Apr. 6	Grading roads; two jobs	C. E. Lason, City Aud.
N. D.,	Casselton	6 p.m., Apr. 6	Sidewalk construction for the year	C. W. Bernam, Co. Aud.
N. D.,	Carrington	10 a.m Apr. 6	Road grading in various townships	E. R. Fairbanks, Aud.
O.,	Urbana	noon, Apr. 6	Furnishing material, curbing and paving	J. W. Flaugher, Dir. P. S.
Ind.,	Greencastle	2 p.m., Apr. 6	Constructing 8,481 ft. gravel road	County Comrs.
Ind.,	Greensburg	1 p.m., Apr. 6	Grading, draining and paving	County Comrs.
Ind.,	Corydon	2 p.m., Apr. 7	8,265 sq. ft. cement walk	Board Co. Comrs.
Ia.,	Anamosa	10 a.m., Apr. 7	Constructing country road	E. J. Hines, Co. Aud.
Ind.,	Madison	1.30 p.m., Apr. 7	Grading, draining and paving	County Comrs.
Ind.,	Sullivan	noon, Apr. 7	8,707 ft. stone and gravel road	County Comrs.
Ala.,	Rockford	noon, Apr. 7	Grading, draining and surfacing; cost, $6,542	Board Co. Comrs.
O.,	Jefferson	1 p.m., Apr. 7	Grading street	Board Co. Comrs.
S. D.,	Leola	3 p.m., Apr. 7	For Galvanized corrugated steel culverts	J. B. Whittmayer.
Ind.,	Kokomo	Apr. 7	Constructing gravel, brick and stone road in several townships	E. B. Swift, Co. Aud.
Ind.,	Winamac	Apr. 7	3 mile road; cost, $8,800	C. E. Paul, Co. Surveyor.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ala.,	Guntersville	noon Apr. 7.	Grading and draining 25 miles road; paving 5 miles chert and gravel; also 4 miles macadam	T. D. Kemp, Co. Engineer.
Ind.,	Knox	noon, Apr. 7.	Grading, draining, paving; two jobs	Board Co. Comrs.
Ind.,	Princeton	10 a.m., Apr. 7.	Grading, draining and paving with stone	Co. Comrs.
Minn.,	Bemidji	2 p.m., Apr. 7.	Constructing part of rural highway	J. L. George, Co. Aud.
Minn.,	Brainerd	2 p.m., Apr. 7.	130 H.P. tractor and 6 dump wagons	J. F. Smart, Co. Aud.
S. D.,	Chamberlain	9 a.m., Apr. 7.	Grading highways, about 20 miles	J. F. Maack, Co. Aud.
N. D.,	Willston	8 p.m., Apr. 7.	Cement sidewalks and crossings for the year	G. G. Harbey, City Aud.
O.,	London	Apr. 7.	2 miles grading and waterbound macadam	County Comrs.
S. C.,	Charleston	7 p.m., Apr. 7.	Furnishing brick, Portland cement, iron castings, concrete sidewalks, etc	J. H. Dingle, City Engr.
Fla.,	Brooksville	noon, Apr. 7.	Furnishing two million vit. paving brick	H. M. Snow, Clk.
O.,	Novo	Apr. 8.	Grading, draining and constructing bituminous macadam, cost $43,388.	J. D. Davidson, Clk.
Wis.,	La Crosse	Apr. 8.	2,635 sq. yds. asphalt macadam; 1,827 ft. cement curb and gutter	Board Public Works.
N. D.,	Glen Burn	2 p.m., Apr. 8.	One elevating road grader	Peter Carlson, Co. Aud.
Minn.,	New Ulm	5 p.m., Apr. 8.	Grading, graveling and boulevarding	A. J. Meyer, City Clerk.
Ind.,	Boonville	10 a.m., Apr. 8.	Grading, draining and paving highway	Board Co. Comrs.
S. D.,	Plankinton	Apr. 8.	15 miles highway	E. Johnson, Co. Aud.
O.,	Columbus	noon, Apr. 9.	Improving and macadamizing roads	J. Scott, Clk. Bd. Co. Comrs.
Ala.,	Greensboro	Apr. 9.	Graveling road, cost $6,542	County Comrs.
O.,	Portsmouth	1 p.m., Apr. 10.	Paving 2,260 ft.	T. V. Patterson, Aud.
Ind.,	Bluffton	10 a.m., Apr. 10.	Constructing roads in three townships	County Comrs.
Ind.,	Elkhart	Apr. 11.	Constructing county highway	County Comrs.
Wis.,	Richland Center	Apr. 11.	6,056 sq. yds. reinforced concrete pavement, 1,683 ft. curb and gutter	City Clerk.
Minn.,	Duluth	2 p.m., Apr. 11.	Constructing about 32 miles of highway	O. Halden, Co. Aud.
N. J.,	Glenridge	Apr. 13.	Furnishing and applying non-asphaltic road oil for 1914	J. A. Brown, Boro. Clk.
Pa.,	Kingston	7.30 p.m., Apr. 13.	5,500 sq. yds. brick paving on 6-inch concrete; 2,100 lin. ft. stone curbing in concrete	W. J. Wiliams, Sec. Borough.
Pa.,	Kane	Apr. 13.	Grading, curbing and paving	Town Council.
Minn.,	Chaska	8 p.m., Apr. 13.	Reinforced concrete approaches to bridge	J. M. Aretz, City Clk.
O.,	Niles	Apr. 15.	Paving six streets; brick on slag foundation	J. N. Cowdrey, Dir Pub. Serv.
Iowa,	LeMars	8 p.m., Apr. 15.	Paving one street	E. S. Townsend, City Clk.
Pa.,	Sandy Lake	7 p.m., Apr. 15.	Grading, curbing and paving with brick	L. Craig, Boro. Secy.
Md.,	Frankford	Apr. 15.	14,500 sq. yds. street paving, concrete curbs, sidewalks and storm sewers	B. H. Boynton, City Engr.
Ill.,	Monmouth	Apr. 16.	5,011 sq. yds. brick paving; 3,813 ft. concrete curb and gutter	J. Brown, Mayor.
Pa.,	Sharpsville	6 p.m., Apr. 21.	12,000 sq. yds. brick pavement	W. A. Graber, Sec.
O.,	Hopewell	noon, Apr. 23.	Macadamizing highways	C. Snyder, City Clk.
Mich.,	Crystal Falls	Apr. 25.	Building 5 miles new earth road	County Road Committee
O.,	Urbana	Apr. 26.	22,500 sq. yds. pavement	Bd. Pub. Service.
N. J.,	Newton	May 1.	Improving 10 miles highway; cost, $100,000	H. Snock, Co. Engr.
Wis.,	Watertown	May 1.	Eight blocks of paving, probably cement	F. S. Webber, City Clk.
O.,	East Liverpool	noon, May. 15.	Paving with brick or paving blocks; eight jobs	E. J. Smith, Dir. Pub. Ser.
O.,	Canal Dover	about June 1.	Constructing brick pavement	W. E. Sykes, Dir. P. S.

SEWERAGE

O.,	Sandusky	Mar. 28.	Constructing vit. pipe sewer, 10-36 inch	R. Wagar, Engr.
Ill.,	Collinsville	2 p.m., Mar. 28.	Sewer construction	Board Local Imp.
Ind.,	Indianapolis	10 a.m., Mar. 30.	Constructing sewers in portions of five streets	Board Public Works.
Ill.,	Chicago	11 a.m., Mar. 30.	Adjusting sewer manholes, catch basins, etc	Board Local Imp.
O.,	Springfield	noon, Mar. 30.	Constructing combined sewer	C. E. Ashburner, City Mgr.
Ind.,	Vincennes	Mar. 30.	Constructing 37,200 ft. 8-24-in. pipe sewer; 8,100 ft. 30-60-in. concrete sewer, cost $100,000	H. T. Watts, City Engr.
W. Va.,	Huntington	Mar. 30.	Constructing trunk sewer	Board Commissioners.
Ont.,	Ottawa	4 p.m., Mar. 31.	Supplying vitrified clay pipe	Board of Control.
O.,	Salem	noon, Mar. 31.	Constructing sanitary sewer	I. N. Russell, Dir. Pub. Serv.
Tenn.,	Memphis	noon, Mar. 31.	Sewer construction	C. C. Pashby, City Clk.
Me.,	Mt. Desert	Mar. 31.	Furnishing and laying 3,000 ft. 6-8-in. vit. pipe, and special castings	Selectmen.
O.,	Bucyrus	Mar. 31.	Constructing about 12,000 ft. sewer	Director Public Service.
Md.,	Baltimore	11 a.m., Apr. 1.	Lateral sewers	C. W. Hendrick, Ch. Eng. Sew. Comn.
Mont.,	Fort Benton	Apr. 1.	Constructing municipal sewer system, cost $33,000	J. F. Murphy, City Clk.
Neb.,	Omaha	Apr. 1.	Extending outlet of 18-inch sewer; purification works; cost, $18,000	E. R. Hune, Clerk.
Neb.,	Dundee	Apr. 1.	Extending outlet of 18-inch sewer and sewage disposal works; cost, $18,000	F. W. Slabaugh, Mayor.
O.,	New Philadelphia	Apr. 1.	Constructing vit. pipe sewer	J. E. Scott, Dir. P. S.
N. J.,	Jersey City	Apr. 2.	Constructing relief sewer	M. I. Fagen, City Clk.
Tex.,	Gilmer	Apr. 2.	Constructing sewer system	T. H. Briggs, Mayor.
W. Va.,	Bluefield	noon, Apr. 3.	Constructing 15-inch vit. sanitary sewer, about 17,000 ft.	Board of Affairs.
O.,	Chillicothe	noon, Apr. 3.	20-inch storm water sewer laterals, with inlets, catch basins, etc	H. M. Redd, City Engr.
O.,	Bedford	noon, Apr. 4.	Furnishing screening and placing filtering material for sewage disposal plant	H. T. Hubbell, Vil. Clk.
Wyo.,	Ft. Yellowstone	11 a.m., Apr. 4.	Constructing outfall sewer	W. L. McLaurn, Quartermaster
Mo.,	Poplar Bluff	7.30 p.m., Apr. 6.	Constructing sanitary sewers, cost $25,756	E. C. Thomas, City Engr.
O.,	Marion	noon, Apr. 6.	Constructing sanitary sewer	E. E. Blazer, Clerk.
N. D.,	Grand Forks	Apr. 6.	Construction of lateral sewer	Council.
Minn.,	Carlton	8 p.m., Apr. 6.	Sewers, manholes and flush tanks	A. H. Lee, Vil. Rec.
Mo.,	Hannibal	noon, Apr. 6.	Sewer construction; cost, $30,000	B. F. Smiley, City Eng.
Pa.,	Duryea	7.30 p.m., Apr. 7.	Constructing sanitary sewer	H. Hervat, Boro. Sec.
Ind.,	Decatur	10 a.m., Apr. 7.	Furnishing common drain tile, salt glazed tile, etc., for year	Board Co. Comrs.
Minn.,	Eveleth	8 p.m., Apr. 7.	2,050 ft. sewer ditch	A. P. Romer, City Clk.
O.,	Urbana	Apr. 7.	Sewage treatment works	J. W. Flaugher, Dir. Pub. Ser.
Minn.,	New Ulm	5 p.m., Apr. 8.	Sewer	A. J. Meyer, City Clk.
Ind.,	Angola	1.30 p.m., Apr. 9.	Sewer, 26,700 ft. vitrified pipe; cost, $43,000	R. Hirst, City Clerk.
O.,	Conneaut	noon, Apr. 9.	Sewer construction, various streets	S. W. Mahaffy, Dir. Pub. Ser.
Sask.,	Saskatoon	Apr. 10.	Furnishing 19,500 ft. sewer pipe; 460 specials	City Comr.
Ill.,	Farmer City	1 p.m., Apr. 11.	Furnishing, hauling and laying tile, etc	Drainage Comrs. of Rutledge, Dist. No. 1.
N. J.,	Newark	Apr. 14.	Constructing main intercepting sewer	Passaic Val. Sew. Comn.
Sask.,	Humboldt	Apr. 15.	Constructing sewer system	W. H. Stiles, Sec.-Treas.
Ill.,	Rankin	Apr. 15.	Constructing storm and sanitary sewer system	J. W. Shepard, Vil. Clk
Wis.,	Menominee	2 p.m., Apr. 15.	For combined sewers	J. R. Mathews, Ch. Bd. P. W.
Ont.,	Simcoe	Apr. 15.	Constructing sewers, cost about $50,000	W. C. McCall, City Clk.
Ia.,	Osage	Apr. 15.	Sewer system and disposal plant	City Clerk.
Pa.,	Reading	10 a.m., Apr. 15.	vit. and iron pipe sewer	E. B. White, City Engr.
Mo.,	Poplar Bluff	Apr. 16.	Sanitary sewer system, cost $25,756	E. C. Thomas, City Engr.
W. Va.,	Bluefield	Apr. 31.	Installing 17,000 ft. sanitary sewers	J. T. Akers, Aud.

WATER SUPPLY

O.,	Cleveland	Mar. 29.	Two shields for lake tunnel and valves	Comr. of Purchases.
N. J.,	Asbury Park	Mar. 30.	Making addition to pumping station, furnishing pipe, air compressor, etc.	S. H. Calvert, City Clk.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
N. J.,	Keyport	Mar. 30..	Remodelling water works	R. O. Walling, Mayor.
Wis.,	Milwaukee	10.30 a.m., Mar. 30..	Boilers for pumping station	Department Public Works.
Ill.,	Chicago	11 a.m., Mar. 30..	Constructing water supply pipes, various streets	Board Local Imp.
O.,	Salem	Mar. 31..	Constructing reinforced concrete basin cover	W. E. Baldry, City Engr.
Minn.,	St. Cloud	3 p.m., Mar. 31..	Furnishing and installing 1,500-gal. centrifugal motor-driven pump	G. S. Magnuson City Clk.
Wash.,	Centralia	Mar. 31..	Constructing 3,500,000-gal. reservoir and connection, cost $25,000; mains, cost $8,000	City Clerk.
O.,	Sandusky	Mar. 31..	300 tons filter alum; about 8,000 ft. c.-i. pipe	E. C. Wagner, Clerk.
Mo.,	St. Louis	noon, Mar. 31..	Constructing head house, pumps, boilers, piping and appurtenances	E. R. Kinsey, Pres. Bd. Pub. Imp.
O.,	Junction City	Apr. 1..	Constructing water works, about $16,000	H. L. Maddocks, Engr., Newark.
N. J.,	Perth Amboy	8.30 p.m., Apr. 1..	Constructing steel water tank, 80 ft. high, 40 ft. diameter	S. J. Mason, Engr.
O.,	Cleveland	noon, Apr. 2..	Cast-iron pipe and special castings	A. R. Callo, Comr. Pur. & Sup.
Ohio,	Cincinnati	noon, Apr. 3..	Furnishing and delivering c.-i. pipe and special castings	P. Fosdick, Dir. P. S.
Man.,	Kirkfield	noon, Apr. 4..	3,100 ft. 8-inch, 30,300 ft 6-inch water pipe; 71 hydrants with valves, etc	F. Ness, Clerk.
Manitoba,	Assiniboia	noon, Apr. 4..	Laying water pipe	F. Ness, Clk. P. O., Kirkfield Park.
Fla.,	Jacksonville	8 p.m., Apr. 6..	Furnishing about 3,000 water meters; contract 12 months; remodelling water works	F. Richardson, Chr.
Iowa,	Winterset	7.30 p.m., Apr. 6..	Furnishing 25 meters, rubber valves, etc	H. S. Ely, Clk.
Ind.,	Crown Point	7.30 p.m., Apr. 6..	Wooden water mains and fittings	H. W. Barry, City Clerk.
Belgium,	Antwerp	Apr. 6..	High Pressure pumps	Burgomaster.
Alta.,	Banff	Apr. 6..	13,500 lin. ft. 20-in. steel pipe; 12,000 ft. 6-in. c.-i. pipe	L. Periera, Sec. Dept. Interior, Ottawa.
Ky.,	Oakdale	Apr. 7..	Installing about ten standard fire hydrants	J. L. O'Neill, City Clerk.
Minn.,	New Ulm	5 p.m., Apr. 8..	Laying 4,370 ft. 6-in. water mains	A. J. Meyer, City Clk.
N. J.,	Allendale	Apr. 9..	Constructing water works	C. F. Smith, Boro. Clk.
R. I.,	Newport	Apr. 11..	Deepening suction well, screen pit, etc	H. R. Stanford, Ch. Navy Dept., Washington, D. C.
Ia.,	Muscatine	Apr. 14..	Pumping plant	Co. Supvrs.
Ore.,	Bonanza	Apr. 14..	Constructing storage dam, diversion dam	J. Bowne, Sec. Dist.
S. D.,	Newell	Apr. 15..	Constructing 14 miles laterals	U. S. Reclamation Service.
Sask.,	Humboldt	8 p.m., Apr. 15..	Water works improvements	W. A. Stiles, Sec.-Treas.
Mont.,	Billings	Apr. 25..	Ingot iron galvanized culverts	City Clerk.
Fla.,	Wauchula	1 p.m., Apr. 25..	Constructing water works and sewer systems	Bond Trustees.
Ia.,	Sheffield	May 1..	Constructing water works and sewer system	City Clerk.

LIGHTING AND POWER

D. C.,	Washington	Mar. 28..	Lighting fixtures, armored cable, switch panel, etc	Maj. F. C. Boggs, Gen. Pur. Off. Isthmian Canal Comn.
Saks,	Regina	Mar. 28..	Furnishing generating or distributing equipment for electrical department	E. W. Bull, Supt. Lt. & Power.
O.,	Liberty Centre	noon, Mar. 28..	Constructing electric light plant	Bd. Trustees, Pub. Affairs.
Wis.,	Milwaukee	Mar. 30..	Two 300 h.-p. water tube boilers and all appurtenances	F. G. Simmons, Comr. P. W.
N. D.,	Fargo	5 p.m., Mar. 31..	Constructing Lighting System	A. R. Watkins, Co. Aud.
N. C.,	Wilson	4 p.m., Mar. 31..	Electric power plant and equipment	Town Commissioners.
Pa.,	Pittsburgh	noon, Apr. 1..	Electric light plants, etc	Lieut.-Col. F. R. Shunk, U. S. Eng. Off.
N. Y.,	Schenectady	10.30 a.m., Apr. 1..	Steam, vacuum and feed pumps, etc	Board Contract & Supply.
Md.,	Princess Anne	6 p.m., Apr. 3..	Lighting streets with electricity	City Clerk.
Fla.,	Jacksonville	3 p.m., Apr. 6..	Furnishing lamps, one year, cost about $3,500	F. Richardson, Chr.
Iowa,	Winterset	7.30 p.m., Apr. 6..	1,000 electric lamps, 500 lbs. insulated wire, 500 lbs. copper wire, etc	H. S. Ely, City Clk.
Wis.,	Kenosha	Apr. 6..	Installing ornamental lighting system and furnishing current	G. W. Harrington, City Clk.
Cal.,	Covina	(about) Apr. 15..	Material for ornamental street lighting system	G. Desery, Engr., Los Angeles.
W. Va.,	Wheeling	Apr. 20..	Fireproof power house; one 115 horse-power boiler	Maj. J. P. Jervey, Corps. Engrs., U. S. A.

FIRE EQUIPMENT

D. C.,	Washington	Mar. 31..	Fire controlled system	Bur. Sup. & Ac., Navy Dept.
Pa.,	Miner's Mills	7.30 p.m., Mar. 31..	500 ft. 2½-inch fire hose	Borough Council.
Ariz.,	Douglas	8 p.m., Apr. 9..	One combination auto hose and chemical wagon	J. A. Howell, City Clk.
Pa.,	Erie	Apr. 9..	5,000 feet 2½-inch cotton rubber-lined fire hose	J. C. Dundon, Sup. Dept. Pub. Safety.

BRIDGES

Ind.,	Anderson	Mar. 28..	Constructing three bridges	J. B. Benefiel, Aud.
O.,	Hamilton	Mar. 30..	Constructing Bridges	Board Commisioners.
O.,	Middletown	Mar. 30..	Constructing bridges	W. W. Crawford, Co. Aud.
Tex.,	Fort Worth	10 a.m., Mar. 30..	Constructing bridge	Co. Aud.
N. J.,	Burlington	11 a.m., Mar. 30..	Reinforced concrete arch bridge	Board Chosen Freeholders.
Pa.,	West Chester	Apr. 1..	Several reinforced concrete bridges	County Controller.
Minn.,	Bemidji	2 p.m., Apr. 1..	Furnishing 113 corrugated metal culverts	J. L. George, Co. Aud.
Ind.,	Peru	Apr. 1..	Constructing 120-ft. span bridge; cost. $8,000	E. McElhaney, Aud.
Mich.,	Lansing	Apr. 1..	Constructing ten highway bridges, 32-150-ft. span	State Hwy. Comrs.
Okla.,	Hobart	1 p.m., Apr. 2..	Constructing nine steel or concrete bridges	County Comrs.
Ohio,	Columbus	2 p.m., Apr. 3..	Constructing bridges and culverts in several counties	J. R. Marker, St. Hy. Com.
Utah,	Salt Lake City	10 a.m., Apr. 4..	Reinforced concrete bridge	L. P. Palmer, Co. Clerk.
N. D.,	Grand Forks	10 a.m., Apr. 6..	Constructing all steel and concrete bridges during the year	H. Anderson, Co. Aud.
N. D.,	Shafer	4 p.m., Apr. 6..	Furnishing carload, mixed sizes, steel culverts	O. P. Benson, Co. Aud.
Minn.,	Little Falls	2 p.m., Apr. 7..	Building highway bridge, 90-foot span	B. Y. McNairy, Co. Aud.
Ind.,	Winamac	Apr. 7..	18 bridges; cost, $23,000	C. E. Paul, Co. Surveyor.
Neb.,	Sutherland	Apr. 7..	Constructing bridge	C. W. Yost, Co. Clerk.
Wyo.,	Thermopolis	Apr. 7..	Constructing bridge	H. M. Hantz, Clerk Bd. Comrs.
S. D.,	Salem	2 p.m., Apr. 7..	Furnishing galv. corrugated metal culverts for the year	A. E. Ecklein, Co. Aud.
N. D.,	Devils Lake	2 p.m., Apr. 7..	Constructing 6 bridges	J. A. Kramer, Co. Aud.
Minn.,	Little Falls	2 p.m., Apr. 7..	Constructing state bridge	B. Y. McNairy, Co. Aud.
Ia.,	Anamosa	10 a.m., Apr. 7..	Constructing bridges and culverts	E. J. Hines, Co. Aud.
N. D.,	Hillsboro	3 p.m., Apr. 8..	Furnishing materials for constructing steel and concrete bridges	County Comrs.
Ore.,	Gold Beach	5 p.m., Apr. 9..	Reinforced concrete bridge to cost $35,000	J. M. Caughell, Co. Sur.
Ind.,	Newton	1 p.m., Apr. 9..	Constructing bridges	E. Simon, Co. Aud.
O.,	Cincinnati	noon, Apr. 10..	Repairing suspension bridge	County Comrs.
O.,	Columbus	noon, Apr. 10..	Bridge approaches and superstructures	County Comrs.
Neb.,	Omaha	noon, Apr. 14..	Constructing 240-foot span bridge	F. Ewey, Co. Clk.
O.,	Montgomery	10 a.m., Apr. 14..	Reinforced concrete arch bridge	Co. Comrs.
O.,	Hamilton	10 a.m., Apr. 15..	Constructing bridges	W. W. Crawford, Co. Aud.
Tex.,	Houston	2 p.m., Apr. 20..	Constructing bridge	B. Campbell, Mayor.

MISCELLANEOUS

Panama,	Canal Zone	11 a.m., Mar. 28..	Furnishing four steel towers	H. R. Stanford, Chf. Bureau Yds. & Docks. Wash., D. C.
Ill.,	Chicago	11 a.m., Mar. 28..	Furnishing flux for asphaltic cement	L. E. McGann, Comr. Pub. W.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ill.,	Chicago	11 a.m., Mar. 30.	Furnishing 2-ton electric truck	R. Palmer, Com. Gas.
Ill.,	Urbana	Mar. 30.	Constructing post-office	Sup. Architect, Treasury Dept., Washington, D. C.
Ill.,	Chicago	11 a.m., Mar. 31.	Superstructure of boiler house	L. E. McGann, Comr. P. S.
Ill.,	Rockford	2 p.m., Apr. 1.	Furnishing combination motor patrol ambulance	Purchasing Committee.
Ill.,	Springfield	9 a.m., Apr. 6.	Furnishing and erecting additional equipment for stone crusher plant	State Board of Prison Industries.
Ind.,	South Bend	11 a.m., Apr. 6.	Ten road rollers, and one 20-bbl. sprinkling wagon	C. Sedgwick, Auditor.
O.,	Lorain	noon, Apr. 27.	Constructing subway	L. B. Johnson, Clerk.
Mo.,	Richmond	May 1.	Constructing court house; cost, $100,000	J. J. Pardue, Co. Treas.

STREETS AND ROADS

Decatur, Ala.—City Council of New Decatur is considering paving Fourth and Fifth Aves. in West Decatur.

Los Angeles, Cal.—Resolution to complete both valley and coast highways between San Francisco and San Diego as early as possible next year, has been adopted.

Sacramento, Cal. — City Commission has taken action on street improvement matters as follows: Adopted resolutions calling for the improvement of D St. from 25th to 31st with curbs, gutters and sidewalks and of 13th St., B to Y, with asphalt pavement; determined to advertise for bids for the improvement of W St. with curbs and gutters from 8th to 20th St.

San Francisco, Cal.—A two-million dollar through highway between San Francisco and Los Angeles by time of opening of Panama-Pacific International Exposition is object of meeting that will be held in Los Angeles at which there will be representatives of two city terminals of proposed road and of thirty-seven counties south of this city. Meeting will consider setting aside of $2,000,000 in state highway bonds and making full provision for absorption or discount as provided by state law.

San Francisco, Cal.—Vitrified brick has been chosen by Streets Committees for paving of 3d St. Assistant City Engineer Shimer reported in favor of asphalt, but Board of Works recomended vitrified brick.

San Francisco, Cal.—Paving and improving of Geary St. has been ordered.

San Francisco, Cal.—Board of Works has approved specifications for grading, paving and curbing Shotwell St., metween 14th and 16th; and 15th St., between Folsom and Howard, the cost being estimated at $16,477; also specifications for grading Plymouth Ave. at estimated cost of $9,000, and for improving Army St., from San Bruno Ave. to Kansas St.

Santa, Ana, Cal.—About 200 ft. of concrete base of Santa Ana-Huntington Beach good road is to be replaced.

Colorado Springs, Colo.—Conference will be called in near future to consider plan of paving Colorado Ave.; estimated cost, $200,000.

Denver, Col.—County Commissioners of Garfield County have announced that no less than $40,000 will be expended on main roads of county during coming summer.

Bridgeport, Conn.—About 12 streets have been ordered sprinkled with oil or water for coming summer.

Wilmington, Del.—Arrangements have been made for selling bond issue totaling $255,000, of which $150,000 will be used for paving and repairing streets.

Wilmington, Del.—Ordinance providing for bond issue of $150,000 for curbing, grading and street paving has been approved by Mayor Howell.

Daytona, Fla.—See Water Supply.

Marianna, Fla.—One hundred thousand dollars of bonds, being third installment of Jackson County good road bonds, have been awarded to Wm. W. Flournoy of DeFuniak Springs, at $100,500 net to county. This is last of $300,000 bond issue voted by Jackson County for construction of system of hard surfaced roads throughout county.

Atlanta, Ga.—List of proposed street improvement work has been submitted to county board.

Atlanta, Ga.—Committee on public works of County Board has agreed to regrade and repave South Forsyth St., from junction of Whitehall to Garnett St., in conjunction with city. Total cost of work will be $25,737, of which county appropriates $12,000.

Chicago, Ill.—Twenty-one miles of improved highways in Cook County will be built as result of action of County Board in approving report of highways committee. George A. Quinlan, Highway Engineer, has stated that estimated cost of permanent roads would be $12,000 a mile, but that, if anything, actual cost would be higher. Following improvements are to be made: South Park Ave. from the south line of the village of Harvey, 1½ miles; Milwaukee Rd., beyond the west limits of the village of Niles, 6 miles; 12th St., from the Desplaines River to the county line, 3 miles; Joilet Rd., from the south line of the village of Lyons, 2 miles; Western Ave., from the south limits of Blue Island, 4½ miles; Archer Ave., from the city limits to the eastern limit of Summit, 3 miles; Halsted St., from 137th St. to the Calumet River, 1 mile.

Springfield, Ill.—Seven highways leading out of Springfield will be converted into hard roads during coming summer, through appropriation of $37,000 made at regular session of Board of Supervisors. Two new roads were selected for concrete and brick paving, when farmers residing along the old Jacksonville and Rochester roads appeared before Board and asked for appropriations so that modern highways could be constructed.

Ft. Wayne, Ind.—By vote of 151 to 34, Marion Township, Allen County, has decided to issue bonds for construction of 14 miles of stone road.

Indianapolis, Ind.—Board of Park Commissioners expects to push as rapidly as possible work of paving Maple Rd. boulevard, formerly known as 38th St., from Capitol Ave. to Fall Creek. It is planned to pave street with asphaltic concrete and estimated cost is about $80,000.

Kokomo, Ind.—Bids of several firms on sidewalk construction are as follows: On North St. walks, H. H. Stewart, 13½ cts. per ft.; brick crossings, $1.25 per yd.; lumber, $32 per thousand. J. H. Smith, $1,512.20; city's part, $315. F. L. Keller, $1,995; $250 for crossings. W. H. Michaels, 14½ cts., new foundations; 13½ cts., old foundation. Superior St. walks, north side, John Dunkle, 5 cts. a ft. Superior St. walks, W. H. Michaels, new foundation, 14½ cts.; old foundation, 13½ cts. Other bid of W. H. Michaels: Superior St. walks, 14½ cts. for new foundation; 13½ cts. for old foundation. Same for Sycamore St. Washington St., 14 cts, new; 13 cts., old. North St., from Morrison, 13½ cts.; brick, 20 cts.; oak lumber, 30 cts.; curb for alleys, 25 cts. South Union, 13 cts., new; 12 cts., old. Purdum, 13½ cts.; alleys, 20 cts. H. H. Stewart & Co., Union St., old foundation, 11¾ cts.; same on two Sycamore and two Superior St. jobs; Purdum, 12⅞ cts. F. L. Keller, Purdum St. walks, $2,370. J. H. Smith, Union St., Sycamore to Superior, $275; Superior to Wildcat, city's part, $25; West North, $135. Kokomo Construction Co., Union St., on sand, 8½ cts.; excavation, 10 cts. ft.

Lafayette, Ind.—Number of West Side streets will be oiled this spring and petitions for this work should be filed at once so that work may be completed before warm weather.

Lafayette, Ind.—Resolution calling for improvement and grading of State St. and North and South Ellsworth Sts. at foot of State St. hill has been adopted.

Marion, Ind.—Voters have decided in favor of bonding township for 14 miles of stone roads.

Vincennes, Ind.—City Engineer Harry T. Watts has been ordered to prepare plans and specifications for paving of Fairground Ave., from Seventh St. to city limits, and it is expected he will have them ready within two weeks. He has also been ordered to prepare specifications for the grading and graveling of Parkinson St.

Algona, Ia.—Bids are being received for various street improvements. S. W. Crowell is City Clerk.

Fort Dodge, Ia.—Petitions for forty-two blocks of paving in north, each and south parts of city are before Council for consideration.

Oskaloosa, Ia.—Oskaloosa city council has adopted resolution of necessity, providing for repaving of High and First Avs. west and Rock Island Ave.

Oskaloosa, Ia.—Resolution has been adopted for improving of various streets.

Leavenworth, Kan.—Estimates on cost of paving 7th St. from Miami to Kiowa Sts. and 6th St. from Shawnee to Miami Sts. have been presented by City Engineer John Franks and approved by city commissioners.

Leavenworth, Kan.—It has been decided to advertise for bids for work of dragging those highways which have been designated as county roads.

Paducah, Ky.—Nearly two miles of additional paved streets may be constructed this summer.

Paducah, Ky.—McCracken County will spend $37,000 on its roads this year, according to decision reached at session of Fiscal Court.

Whitesburg, Ky.—Petition is being circulated in Letcher County asking County Judge Henry T. Day to call election for voting bonds sufficient to construct model roadways throughout county.

Chestertown, Md.—Kent County is asking for appropriation of $150,000 from state road fund, to be used in construction of permanent road from Chestertown through Fairlee to point on Chesapeake Bay.

New Bedford, Mass.—Both branches of City Council have voted in favor of three bond issues from borrowing capacity, recommended by mayor, and city treasurer was directed and authorized to raise from this source $225,000, which was appropriated to use of street and sewer department as follows: $125,000 to general permanent improvement work on highways; $50,000 for installation of sewers; $50,000 for laying of macadam roads.

Flint, Mich.—Exact cost of each pavement for which contract has been awarded by common council is shown in table completed by City Engineer Shoecraft. Streets to be paved and cost of each are as follows: Ann Arbor from Court to Fenton, $8,977.38; Avon, St. John to Boulevard, $5,142.87; Avon, Richfield Rd. to river, $6,356.31; Beach, Court to Kearsley, $13,112.65; Church from Court to Kearsley, $12,423.58; Crapo from Second to Richfield Rd., $9,669.14; Fenton, Ann Arbor to P. M. tracks, $5,001.69; First Ave., Detroit to Garland, $3,347.44; Grand Traverse, Court to Kearsley, $12,503.34; Hamilton Ave., P. M. east, $1,143.30; Harriet, Industrial to P. M., $3,055.58; Kearsley. East to Walnut, $27,815.57; Lapeer, Court to Ninth, $11,443.32; Richfield Rd., East to Geneseret, $15,134.06; South Saginaw, 15th to Peer Ave., $23,139.59; St. John, Avon to Houran, $10,819.38; total, $169,085.70.

Midland, Mich.—Jerome township is pushing good roads proposition and will probably be first township in county to have three miles of state award highway. Contract was let to Steve Burton, of Bay City, for completion of three miles of road. This road is on state trunk line, and when complete will be nine feet wide and have a surface of two courses of crushed stone. Grading on this three miles of road is already finished and cost $1,400. Price for balance of work is $10,800. Total cost of the three miles is $12,800; state award on same, $6,000.

Crosby, Minn.—Plans for building of new roads, etc., are being discussed.

Duluth, Minn.—Vernon St. will be paved with concrete.

Lewistown, Mont.—City Council has declared its intention of paving First Ave., from Washington to Beyond Pine St., and Janeaux St., from Third to Fifth Ave., 12 blocks in all. This is in addi-

tion to extension of Main St. paving, previously agreed upon.

South Omaha, Neb.—Council has approved plans and specifications for 13 paving districts. Watson Townsend is City Engineer.

Story City, Nev.—Auditor is advertising for bids for grading of large amount of highway in vicinity of Story City, amounting in all to approximately 12,000 cu. yds. of excavation. Work is to be done in accordance with plans, specifications and profiles now on file at that office. These bids will be received until 10 o'clock, March 27, 1914.

New Brunswick, N. J.—Resolutions have been passed authorizing improvement of about 37 streets by regulating, grading and paving. Kind of pavement to be used on said streets will be vitrified brick, granitoid, asphalt, wood block, bitulithic, or some other suitable pavement as may be finally selected by Common Council. J. J. Curran is St. Comr.

Auburn, N. Y.—Sum of $1,000 has been appropriated by Town Board of Owasco for road between Baptist Corners and Owasco village. Another $1,000 was set aside for macadam road between greenhouses at Melrose to Baptist Corners.

Fulton, N. Y.—Sprinkling of streets is being discussed.

Geneseo, N. Y.—Livingston County will have about 40 more miles of improved road for her proportion of benefits from $50,000,000 state bond issue, the new Albany records showing that no less than nine more county highways will be improved under state supervision. First road slated for construction is Moscow-Cuylerville-Geneseo highway; next the Moscow-Perry road; then Conesus-Wayland road; Groveland Station-Hamptons Corner; Conesus-Dansville; East Avon-Monroe County line; Geneseo-Lakeville, and Livonia-Conesus roads. These roads will be constructed as fast as apportionments from big bond issue become available.

Hempstead, L. I., N. Y.—Town Board of Hempstead has authorized Town Superintendent of Highways, Robert Bower, to expend $28,000 on roads for ensuing year. There are 1,000 miles of highways and sum of $28 will be spent on each mile. In addition to this amount for maintenance following sum will be expended on various roads for permanent construction: $4,300 on Franklin St. leading to Merrick Rd.; $3,000 on Horton Rd. leading to the Rockaway Rd.; $2,600 on Dutch Broadway; $1,400 on Corona Ave.; $325 on the dividing line between the towns of North Hempstead and Hempstead; $1,840 on Scranton Ave. from Rockaway Rd. to Brooklyn Ave.; $1,680 on Brooklyn Ave. from Scranton Ave. to Rockaway Rd.; $2,350 on Hunt St. from Wantagh Ave. to Seaman's Neck Rd.; $2,650 on Oceanside Rd. from Watson Ave. to Mott Ave.; $2,600 on Cherry Valley Rd. from St. Paul's Rd. to 11th St.; $1,220 on Grand Ave., running to Freeport; $2,950 on Woodfield Rd. to Oceanside Rd.

Ithaca, N. Y.—It has been decided to create an oiling district in village.

Newburgh, N. Y.—Large number of streets are to be oiled at expense of abutting property owners.

Newfane, N. Y.—Town Supt. of Highways Elmer L. Brown states that active work will start on road improvements early in spring. First work will be on Main St., in village of Olcott. Coarse gravel will be used as base for that road and fine gravel for top dressing. Work on Charlotteville, Ewings and Youngstown roads will follow in order.

Port Jervis, N. Y.—Electors have voted $7,000 for paving highways leading into city and $1,600 for oiling streets this summer.

Silver Creek, N. Y.—See Miscellaneous.

Southampton (L. I.), N. Y.—At meeting of Southampton Town Board, principal business was question of two proposed new highways, one at Canoe Pl. and one at East Quogue.

Schenectady, N. Y.—Representative A. B. Young of State Highway Department and County Highway Superintendent Harry W. Cregier are considering plans of proposed county highway from Nott St. to Thomas' Corners in Town of Glenville. Plans were duly approved, as follows: Beginning at Nott St. and running to the undergrade crossing, the road will be 30 ft. wide with curb at both sides. From the undergrade crossing to Senect St. the road will be 18 ft. wide with concrete edging. This section will be constructed with Topeka specification, asphalt top on concrete base. From Seneca St. to Freeman's Bridge a concrete road will be built 16 ft. in width. Three hundred feet on each side of Freeman's Bridge the road will be only graded and graveled until the barge canal is completed and the bridge raised. From Freeman's Bridge to Thomas' Corners, a distance of 1.5 miles, a concrete road will be built 14 ft. wide with 2 ft. of gravel on both sides. The additional width is estimated to cost the city of Schenectady $4,254, and the total cost of the balance of the road is estimated at $32,000. The portion within the city limits will be divided so that 50 per cent. of the cost will be paid by the state, 35 per cent. by the county and 15 per cent. by the city. Outside the city limits the cost will be divided at 65 per cent. to be paid by the state and 35 per cent. by the county.

Syracuse, N. Y.—More than $1,000,000 will be needed to carry out plan for widening South Warren St., between East Genesee and East Onondaga Sts.

Union Springs, N. Y.—By vote of 68 to 27 it has been decided to create oiling district in village. Streets will be oiled by village officers.

Greensboro, N. C.—Bond issue of $50,000 for street improvements and public playgrounds is being considered by City Commissioners and voters will probably be called upon to determine question of such an issue within next two months.

Raleigh, N. C.—Table has been made showing distribution of new street paving in case proposed bond issue of $100,000 is carried. Three types of pavement are considered in plan as furnished, these being asphalt-concrete of Topeka type; bituminous macadam, and bituminous clay gravel.

Cincinnati, O.—Resolutions have been adopted for improvement of various streets.

Columbus, O.—Work on 24-mile stretch of old National road to be improved this year in Ohio will start May 1. Contracts will be let April 1, State Highway Commissioner James Marker has announced. Road runs from Zanesville west along Licking River. It will be of concrete all the way and will cost approximately $440,000. National government pays $120,000 toward project, Licking and Muskingum Counties, through which road runs, will together put up $240,000 and other $80,000 will cost out of state funds raised by Hite half-mill levy.

Columbus, O.—Contracts for building more than 40 miles of main market roads and inter-county highways at cost of $600,000 will be awarded by state highway department during next month. Of this amount, 24 miles will be constructed on old National Pike east of Columbus, at cost approximating $400,000. Contracts for work on old National Pike are to be awarded April 15. Improvement is to be made of concrete. Work will be let in two parts. Engineer's estimate on 13.83 miles in Licking County is $221,280, and the estimate on 10.12 miles in Muskingum County is $162,080. In Portage County, where 3.94 miles are to be constructed on Ravenna-Parkman Road, bids are asked for on both brick and concrete construction. The estimate for brick is $62,707.73, and on concrete, $49,044.15. This contract is to be awarded April 3. Other contracts that will be awarded April 3 are: Delaware County, 1.9 miles, Trenton Road, macadam, estimate $11,286.42; Fulton County, 1 mile, section 1, Archbold-Fayette Road, macadam, $8,870.59; Fulton County, 1 mile, section 2, Archbold-Fayette Road, macadam, $8,872.55; Hamilton County, 3.18 miles, Dunlap-Springfield Road, macadam, $40,304.16; Lawrence County, 1.27 miles, section 2, turnpike 3, macadam, $13,910.50; Summit County, 1.17 miles, Akron-Kent Road, brick, $25,839.57; Scioto County, 1.45 miles, Scioto River Road, brick, $30,925.54; Wayne County, 1.5 miles, Akron-Wooster Road, brick, $23,940.90.

Columbus, O.—Bids will be received at office of Board of County Commissioners of Franklin County, Ohio, Columbus, until 10 a. m., on April 2, 1914, for purchase of the Franklin County road improvement bonds. John Scott is Clerk of Board.

Dayton, O.—Paving of Webster St. and Leo St. has been recommended.

Dayton, O.—Improvement of streets in vicinity of Mt. Anthony is being discussed.

Delaware, O.—Resolution has been adopted for improvement of Darlinton road. J. L. Anderson is Mayor.

Fairfield, O.—Arrangements have been made for issuing bonds in sum of $25,000 for building of proposed good roads.

Lima, O.—County Commissioners are planning active campaign on roads of Allen County this year.

Marietta, O.—By passing the $70,000 bond issue by Wiliams District, W. Va., for improvement of its roads in special election held in Williamstown District, a paved and concrete road between this city and Parkersburg, on West Virginia side, is practically assured.

Sandusky, O.—County Surveyor Schultz has announced that all the plans for two miles of Lake Shore road in Erie County will be completed by April 1 and everything will be in readiness to commence work as soon as ordered to do so by County Commissioners or Highway Department.

Sandusky, O.—Bonds in sum of $5,500 will be sold by F. W. Bauer until noon, April 18, for paving and curbing various streets.

Springfield, O.—Notice is given that trustees of Springfield Township, Mahoning County, Ohio, will offer for sale $50,000 worth of bonds for improvement of roads within said township, for which sealed bids will be received by L. W. Scholl, township clerk, Petersburg, Mahoning County, Ohio, until 1 o'clock p. m. April 11, 1914.

Urbana, O.—Bids will be received by H. M. Crow, City Auditor until noon, April 6th for purchase of $16,500 bonds for paving certain streets.

Portland, Ore.—C. W. Woodruff has been elected engineer for proposed hillside scenic boulevard extending along crest of mountain overlooking Williamette from northerly limits of this city to point below Linnton, distance of nearly 11 miles.

Chester, Pa.—Repairing of Edgmont Ave. is being discussed.

Erie, Pa.—Money will be provided in budget for street cleaning apparatus.

Johnstown, Pa.—Many petitions have been received by Council for foot front paving.

Sandy Lake, Pa.—Bids will be received on April 15 for about 6,700 sq. yds. paving, 3,000 cu. yds. excavation and 4,000 lin. ft. curbing. Lorenzo Craig is Borough Secretary.

Charleston, S. C.—A tentative program of street paving operations for year has been prepared for committee on streets and within next few days will be submitted to various members for their approval.

Sioux Falls, S. D.—Specifications included in resolutions adopted by Board of City Commissioners for paving of Phillips Ave., between Seventh and 13th Sts., and 13th and 18th Sts., provide for bids to be made on eight different kinds of pavement. Resolutions were also adopted for paving of Duluth Ave., between Third and 18th Sts.

Dandridge, Tenn.—Bids have been opened on about $150,000 of pike work to be done here during coming spring and summer. Pike Commission will award contract as soon as it is learned whether bids come within specifications.

Knoxville, Tenn.—Question of advertising for bids for paving Gay St. will be taken up shortly.

Sevierville, Tenn.—Work on pikes of Sevier County will be started as soon as weather opens up, and as soon as pike commissioners are notified that bonds are approved by attorneys of Spitzer-Porick Company, Toledo, O., who purchased $180,000 bonds issued for building of pike roads in Sevier County.

Trenton, Tenn.—Committee appointed to draft resolutions pertaining to best method of building good roads has recommended that county appropriate $10,000 to be spent in building good roads during present year, and that amount be divided among three road commissioners of county—$4,000 to Commissioner J L. Brown's territory, $3,000 to Commissioner Thetford, and $3,000 to Commissioner Lessenberry. It also recommended two public highways be built across county, one from the Carroll County line to Eaton, and one from Humboldt to Kenton.

Austin, Tex.—At meeting of good roads committee from Austin, San Antonio, San Marcos and New Braunfels, it was unanimously decided to carry out movement to build Federal road between Austin and San Antonio.

Austin, Tex.—Approximately 250 miles of graveled and macadamized county roads are to be constructed in Collin County within next few months, according to Judge H. L. Davis, County Judge of that county, who is here with record in first issue of bonds to be issued for that purpose, and there will be issued about $2,000,000 in bonds for that purpose.

Bastrop, Tex.—It has been unanimously decided at meeting of Commercial Club and citizens of this Justice Precinct to hold election for purpose of issuing additional bond issue of $70,000, to be used in completion of roads and erection of two low water concrete bridges over Colorado River, one at Nash's Ferry and one at Samp Ground ford.

Commerce, Tex.—Commissioners' Court has ordered election for April 11 for Commissioners' Precinct No. 4 to determine issuing of $200,000 bonds for good roads. It is estimated that this amount will build 60 miles of good roads, which will practically cover entire precinct.

Denton, Tex.—Commissioners' Court has ordered election to decide issuance of $300,000 road bonds for special district, including Denton, election to be held on April 25. Petition for election state that eight miles of improved roads are to be built within city.

Houston, Tex.—Work on several roads has been ordered by County Commissioners. The Chocolate Bayou Road was ordered paved with gravel. Specifications were ordered and bids will be called for. Navigation Boulevard was ordered marked so that men of convict camp No. 2 can begin work on it. Ray St., from Kiam to Long, two blocks on Long St. to Gentry, four blocks on Gentry, and four blocks on Thomson, from Washington Ave. to Patterson were ordered paved with gravel. Bids will be taken immediately.

Mineral Wells, Tex.—Commercial Club has appointed committee to confer with Commissioners' Court on expenditure of $100,000 recently voted for construction of macadam roads.

Paris, Tex.—Bids have been opened for paving of South 22d St. with Bowers gravel and concrete curb and gutters from present terminus of paving to Evergreen Cemetery, price being 73c. for gravel and 75c. for concrete work. Secretary has been directed to advertise for bids for paving 32d St. with gravel.

Terrell, Tex.—Petition resulting from mass meeting held for purpose of $300,000 bond issue for good roads has been granted by Commissioners' Court at Kaufman. Election has been ordered for April 16.

Ogden, Utah.—City has sold $50,000 bonds for paving intersections on 25th St. from Wall to Harrison Aves.

Pocatello, Utah.—City Council has passed grading and surfacing measures and provided for $105,000 worth of street improvements for coming season. Another ordinance was passed calling for bond election to provide fund of $100,000 with which to pave certain sections of more important streets that are not included in present paving districts.

Alexandria, Va.—Number of street improvements are being mapped out by City Council. They will be begun at early date.

Woodland, Wash.—Council will pave about one mile in principal business streets of town.

Poultney, W. Va.—Trustees have decided to spend $25,000 each on Rock Hill and Brook's Run roads.

Milwaukee, Wis.—Bids approximating $180,000 for construction of county roads have been recommended to county board for approval by committee on highways and bridges. Work on over 13 miles of road will be begun as soon as weather becomes suitable. About three-quarters of a mile on Hawley road will be completed by Meyer Construction Co. and 1½ miles on the Cedarburg road by Dean Construction Co. Gumz, Sutknecht & Wassow Co. were awarded contract for completion of sections 2 and 3 of Green Bay road for distance of 7 miles; Loomis road for 2½ miles, and Kilburn road for distance of 1⅜ miles.

Superior, Wis.—Resolution has been passed ordering Cumming Av . road paved between Winter St. and 21st St.

Niagara Falls, Ont., March 12.—At special meeting Welland County Council decided to build 34 miles under county good roads system by contract this year. Following roads will be let by contract: nine miles through Wainfleet township, from Feeder Rd., west to county line; three miles on Garrison Rd., to Fort Erie; five miles from Fonthill to Fenwick; seven miles from Thorold and Stamford to Fonthill; eight miles from Stamford to Crownland Town Hall; two miles in Willoughby.

Contract for supplying stone for road construction this year has been awarded the Standard Crushed Stone Company of this city.

Grant of $2,500 was voted village of Chippewa toward cost of building one mile of macadam road through that village as a connecting link in the county system. Expenditure on system this year will probably run from $150,000 to $200,000.

CONTRACTS AWARDED.

Tucson, Ariz.—Contract for concrete sidewalk work on Main St. has been awarded by City Council to Arizona Grading & Construction Co., who bid 14.2 cts. per sq. ft. for concrete work and 37.5 cts. per lin. ft. for curbing.

Telluride, Colo.—By Co. Comrs., for constructing State Primary Road No. 44, between city of Telluride and town of Pliacerville, to W. H. Doyle, of Telluride, at $7,250. Robt. E. Hogan is Co. Clk.

Tampa, Fla.—For paving number of streets, to R. M. Hudson Co., Atlanta, Ga., $125,000.

Peoria, Ill.—For paving Bigelow St., to John McAllister, Edwards Flat, Peoria, at following bid: 3,825 cu. yds. excavation, 24 cts; 216 ft. stone curb, 4x14-in., 30 cts.; 5,365 ft. cement curb, 6x22-in., 35½ cts.; 9,175 sq. yds. concrete foundation, 47 cts.; 9,175 sq, ft. sand cushion, 2-in., 4 cts.; 9,175 sq. yds. brick pavement, 95 cts.; 9,175 sq. yds. sand filler, ½-in., 2 cts.; adjustment of sewers, $15; total, $16,481. Totals of other bids: D. A. Myers, 209 W. Armstrong St., $17,-982; Canterburg Bros., 516 Windom St., $18,047; A. D. Thompson, Anheuser Neil Bldg., $18,523; McElwee & Bushnell, 1317 S. Washington St., $18,701. L. D. Jeffrees is City Engr.

Mishawaka, Ind.—To Fred Corpcown, contract for 12,000 ft. of sidewalk on West Broadway and 2,000 ft. of curb.

Bettendorf, Ia.—For pavement as follows: 2,636 sq. yds. concrete to Aug. Kooneman, of Muscatine, Ia., at $1.03 per sq. yd., and 8,716 sq. yds. brick to McCarthy Improvement Co. of Davenport, Ia., at $1.80. H. T. Abramson is Town Clerk.

Nevada, Ia.—For constructing 13 blocks of paving, to P. E. Shugart of Navada, Ia., at $1.51 per sq. yd. Reinforced concrete will be used. Sam. Stugerwalt is City Engr.

Manhattan, Kan.—For 60,000 sq. yds. of paving, to W. B. Stingley & Co., Manhattan, at about $90,000. Other bidders were: Kew Paving Co., $92,400; Alpine Construction Co., $93,000, and Geiger Construction Co., $92,000. O. E. Noble is City Engr.

Louisville, Ky.—Contracts for city-pay paving have been awarded by Board of Public Works for six streets at total cost of $105,303.20. Contracts were awarded for original brick streets and alleys to low bidders. Asphalt reconstruction awarded is as follows: Bardstown road, to the Henry Bickel Co., $32,-062; Broadway, to American Standard, $27,145; Market, to Louisville Asphalt Co., $33,332.05; Barret, to Henry Pickel Co., $5,187.10. Wood stringers will be used for first time on all jobs exceppt Bardstown road. Reconstruction of Everett with bituminous concrete on concrete foundation, to Henry Bickel Co., $3,209.85, and St. Catherine, with bituminous on macadam foundation, to the Hoke Co., $4,367.20.

Louisville, Ky.—Tabulation showing lowest bidders for street and alley construction have been made public by City Engineer Lyman.

Lowest bidders and their total bids were:

Asphalt Reconstruction — Bardstown Rd., Bickel Paving Company, $30,559; Broadway. American Standard, $27,145; Walnut, Bickel Paving Company, $14,-239; Jefferson, American Standard, $19,-559; Market, Seventeenth to Nineteenth, Louisville Asphalt, $13,483; Market Nineteenth to Twenty-seventh, Louisville Asphalt, $19,849, and Barret, Bickel Paving Company, $5,187.

Brick Reconstruction—Shelby, Kentucky to Oak, G. W. Gosnell, $9,104.

Bituminous Concrete—Everett, Bickel, $2,972; St. Catherine, concrete foundation, American Standard, $4,913, and the Hoke Company low on macadam foundation.

Original Construction With Brick — Ninth, G. W. Gosnell, $6,320; Twenty-third, Rowan to Duncan, L. R. Figg, $3,642; Main, Twenty-eighth to Twenty-ninth, L. R. Figg, $4,993.

Asphalt—Deer Park, Bardstown Rd., to Schwartz, Bickel Paving Company, $9.240; Durwood, Bardstown road, to Schwartz, Bickel Paving Company, $8,-368, and Dearborn, Broadway to Garland, Louisville Asphalt, $10,700.

Figg was low on four alleys, Gosnell on three and Bickel on one.

Lake Charles, La.—By City Commission Council, to Kaw Paving Co., Topeka, Kan., contract to pave Broad St. with bitulithic concrete: On paving, $1.70 a sq. yd.; sewer pipe, from 40 cts. for 6-inch pipe in place to $2.45 for 24-inch pipe; gutter and curb combined, 65 cts a lin. ft.; curb alone, 30 cts.

New Orleans, La.—For construction of shell roadways and shell footwalks at west end Lake Shore Park. to Jones & Irving, at $53,345.50.

Baltimore, Md.—Contract for repaving Charles St., between Chase St. and North Ave., with sheet asphalt and granite blocks, has been awarded by Board of Awards to P. Flanigan & Sons. This firm's bid is at rate of $1.84 a sq. yd. Contract also calls for repaving of following other streets: Howard St., from Park Ave. to Cathedral St., and Park Ave., from Richmond St. to Lanvale. Total bid of Flanigan company is $60,-549.80.

Crookston, Minn.—For paving with westrumite portions of Holly Ave., S. Ash and Spendley Sts., about 6,527 sq. yds., by City Council, to C. C. Sloan of Crookston, at $2.03 per sq. yd.

Duluth, Minn.—Contracts for road work to be prosecuted in the Second, Fifth and Seventh commissioner districts have been let by county board. Contracts were awarded as follows:

Clearing and grubbing two miles of the change in the Vermillion Rd., along west lines of sections 2 to 11, 51-14; Henry Walkowaik, $640.

Clearing and close cutting to a width of sixty-six feet of three and a quarter miles of the Rice Lake Rd., north from city limits; J. D. O'Connell, $315.

Constructing one-half mile of Flynn Rd., on east half of south line of section 14, 51-13; H. H. Thompson, $523.

Constructing one and a quarter miles of the Munger Rd., north from the Morris Thomas Rd., and one and a half miles of the Morris Thomas Rd., west from south one-quarter of section 26, 5-16; Preston & Kribsback, $3,195.

Constructing one and one-half miles of the Shipley Rd., from south one-fourth of section 4, 52-17, to northeast corner of section 4, Charles Schelin, $1,200 per mile.

Constructing three miles of the Cotton Rd., east from the White Face river in 54-17; Ed. Randall, $2.50 per rod.

Constructing one mile of Connors' Rd., through section 32, 59-21; Elmer Swanson, $1,344.75 lump sum.

Constructing three miles of the Town Line road on south lines of sections 31, 32 and, 3, 57-19; Einar Sepponen, with prices, about $1,000 per mile.

Constructing one and one-half miles of the Connors' road, section 19, 59-21, and one-half of the Stingy Lake Rd., from same, Elmer Swanson, $3,894.50.

Constructing two miles Buhl & Little Fork Rd., south from Tower-Itasca Rd., Karl Hagglund, $3.69 per rod.

Constructing five miles, Fraser and Sax Rds., south from southeast corner of section 25, 57-19; Einar Sepponen, unit prices, about $1,000 per mile.

St. Paul, Minn.—Contracts for street grading have been awarded as follows: Grading Hendon St. from Cleveland to Como Aves., W. H. Malone, $6,435; grading Roy St. from Shields to St. Anthony Ave., W. H. Malone, $365; grading Doswell Ave. from Raymond to Cleveland Aves., W. H. Malone, $895.

Dunkirk, N. Y.—J. P. Hurley, of Fredonia, has been awarded contract for paving East State St., in Olean. Mr. Hurley was low bidder for 32-ft. pavement, his bid being $55,000. He will commence work at once. Contract was awarded by State Department of Highways.

Ilion, N. Y.—For paving with bitulithic ¾ mile on Second St., by Board Trustees and Board Street Commissioners, to Warren Bros. Co., of Boston, Mass., at $38,044.

Syracuse, N. Y.—Board of Contract and Supply has opened bids on paving of Tulley St. after two previous sets of bids had been rejected. J. C. Dempsey was low on brick with stone curb bid, his figure being $13,294.65. Hookway Co. was low on bid for combined curb with figure of $12,503.90. Hookway Construction Co. was given contract for paving Willis Ave. with brick and stone curbs. Figure was $60,196.50. Contract for resurfacing East Jefferson St. was let to Warner-Quinlan Co. for $22,622.

Cincinnati, O.—For constructing Geist Road in Whitewater Township, to D. C. Foley, Saylor Park, at $22,256. Albert Reinhardt is Clk. County Comrs.

Carbondale, Pa.—The Sproul Construction Co. of Peekskill has secured contract for building Pennsylvania County road between Carbondale and Forest City, Pa. Contract calls for the construction of $165.000 yards of concrete-asphaltic material at $1.79 per yd. Work will be started ealy in spring.

Patterson Heights, Pa.—To George McFall. contractor of Beaver Falls, contract for paving of Hillside Ave., by Patterson Heights Borough Council. Mr. McFall's bid was $6,315.

Scranton, Pa.—For construction of macadam road in Carbondale, by County Controller, to H. B. Sproul Contracting Co., 15 North Division St., Scranton, at $1.79 per sq. yd. Other bidders were: Gaynor Contracting Co., $1.83; Richard

Hopkins, $1.89, and Hughes & Gardner, $1.79. Charles P. Savage is County Controller.

Uniontown, Pa.—For paving Albany Hill Rd., to F. J. Foye, Brownsville, Pa., at $20,446. H. Kisinger is County Controller.

Williamsport, Pa.—At meeting of County Commissioners and County Controller Savage, contracts for new section of county road between Carbondale City line and Susquehanna County, were let to H. B. Sproul Contracting Co., of Peekskill, N. Y. Their bid was lowest on all kinds of asphalt. There is approximately 65,000 yds. of pavement to lay and bid of $1.79 per yd. will make county's share of pavement reach to $116,350. Bids in detail are as follows: Gaynor Construction Co., Texaco asphalt, $1.83 a yd.; Richard Hopkins Co., Troy, N. Y., Bermudez, $1.99; Standard binder, $1.89; Texaco, $1.99; H. B. Sproul Contracting Co., Bermudez, $1.96; Trinidad, $1.96; Standard binder, $1.79, and Texaco, $1.86; Hughes & Gardner Contracting Co., Texaco, $1.79. Foregoing bids are all for top and base. Bids for railway top course or that part of road between car tracks, are as follows: Gaynor Co., Texaco, $1.10; Hopkins Co., Bermudez, $1.49; binder, $1.38; Texaco, $1.49; Sproul Co., Bermudez, $1.02; Trinidad, $1.02; binder, 85c.; Texaco, 92c.; Hughes & Gardner, Texaco, 87c.

Knoxville, Tenn.—Contracts have been awarded by Knox County Road Commission for repairing Martin Mill pike and grading of Beaumont road. R. L. Peters of Knoxville was awarded contract for repairing Martin Mill pike. Estimated cost of this work being $6,000. J. Rans Simpson being lowest for grading was awarded contract to grade Beaumont road. Estimate is about $1,000. Bids on repairing Sevierville pike were tabulated. Commission decided they were too high and will readvertise the work.

Maryville, Tenn.—Contract for macadamizing extension of Maryville-Walland road from end of present pike to Little river bridge has been let to J. Mack Davis, of Blount County.

Beeville, Tex.—City Commissioners have entered contract with Marshall White and L. G. Hamilton for $25,000 worth of highway.

Waco, Tex.—To Texas Bitulithic Co. of Dallas, contract for 55,000 sq. yds. paving.

Centralia, Wash.—Work on improvement of National Park Highway, between Ceres and Dryad, has been awarded by Lewis County Commissioners to G. Korevaar, a resident of Mays. Contract price is $2,845. Stretch in question is part of highway connecting Lewis and Pacific counties.

Seattle, Wash.—For grading Southlake Ave., to P. J. McHugh, at $39,693.93.

Tacoma, Wash.—By Public Works Commissioner Woods, contract for laying sidewalks in Asotin, S. 52d and S. 53d Sts., yesterday, to E. J. Marchfield for $6,723. Mr. Woods was also awarded contract for grading S. 41st St. from Sheridan to Asotin Sts. to McHugh Contracting Co. for $5,616.

Chippewa Falls, Wis.—For paving with asphalt macadam W. Central St., to Fred Eul, Menasha, as follows: 8,209 sq. yds. asphalt macadam pavement, $1.51; 4,020 lin. ft. concrete curb and gutter, 50 cts.; curb without gutter, per lin. ft., 38 cts.; gutter without curb, per lin. ft., 34 cts.; 396 lin. ft. concrete headers, 20 cts.; 20 gutter crossings, each, $8.50; total, $14,655. Other bidders: Chris. Johnson, Oshkosh, $16,039; Thos. E. Woolley, La Crosse, $14,981. A. T. Thompson is City Engr.

SEWERAGE

Tempe, Ariz.—Common Council has set date for $30,000 bond election on sewerage system construction for April 25th.

Hartford, Conn.—At meeting of Board of Finance approval was voted of appropriation of $100,000 for city's share of constructing extension of Homestead Ave. intercepting sewer from near Adams St. to Uphill St., also storm water overflow from Park River to Granby St. and sewer in Westbourne Parkway from Granby St. to Blue Hills Ave.

Atlanta, Ga.—List of proposed sewer work this year has been submitted to County Board.

Richmond, Ind.—Construction of trunk sewer in Morton Park has been ordered.

Vincennes, Ind.—According to City Engineer Harry T. Watts, cost of storm water system which city proposes to build this spring will be in neighborhood of 1 cent per square foot to property owners in district. Sewer itself will not cost to exceed $103,000 and will permit building of at least sixteen miles of paved streets.

Nickerson, Kan.—Council is considering construction of sewers.

Pittsburg, Kan.—Ordinance has been passed to provide for construction of 8-in. tile sewer lateral in Sewer Lateral District No. 24, in Main Sewer District No. 3, in City of Pittsburg.

Baltimore, Md.—Sewer disposal system will be installed in Glynden Park.

Clinton, Mass.—Total of $8,000 has been appropriated for sewer construction.

Haverhill, Mass.—It will cost $8,065 to build proposed sewer on Kenoza Ave. and adjacent streets north of Fountain St. It would cost $25 a month additional to maintain the sewer, because the land being below the water level, it would require a pump to take sewage from lowland pipes. Table of costs prepared by city engineer's office is as follows: 3,000 ft. 6-in. iron discharge pipe, in place at 90 cents, $2,700; 4,500 ft. 8-in. sewer pipe, in place at 85 cents, $3,825; eighteen manholes at $30, $540; automatic electric pump, $500; pump house and pump, $500.

New Bedford, Mass.—See "Streets and Roads."

Flint, Mich.—Common Council has instructed City Clerk to advertise for bids for construction of sanitary sewer on Spencer St. from Industrial Ave. to North St., and one from Court St. and Vosburg St. to the river by way of Bismark and Garden Sts. Estimates made by city engineer of cost of constructing the two sewers are: Spencer St., $822.01; Court St. to river, $3,035.54.

Binghamton, N. Y.—City Engineer John A. Giles has called attention of Council to necessity of immediate steps being taken for construction of intercepting sewer in Fifth and Sixth Wards extending from Rockbottom bridge to point west of DeRussey St. Sewer is needed to pick up discharge of sewers in this section which now empty into Susquehanna River, and to convey them to sewage disposal site. It has been planned to build this intercepting sewer along bed of old canal, which could be done without excavation and at expense of about $18,000. If old canal lands are filled in for park purposes, as is now being rapidly done, before sewer is laid, it will necessitate constructing sewer along river bank at increased expense, aggregating $25,000. .Communication has been referred to committee on sewers and sewerage.

Binghamton, N. Y.—Question of constructing number of lateral sewers in First Ward is being considered.

Dunkirk, N. Y.—Building of intercepting sewer is being considered.

Port Jervis, N. Y.—Electors hrve voted $1,600 for sewer purposes.

Cleveland, O.—Contract will be awarded this month for building of new 5-ft. intercepting sewer out to the disposal plant to be erected in Newburg Heights. Estimated cost, $600,000.

Newark, O.—Resolution has been adopted for construction of drainage sewer in Park Ave. R. C. Bigbee is Mayor.

Sandusky, O.—Bids will be received by City Auditor until noon, April 18, for purchase of $53,000 bonds for constructing sanitary and storm water sewers. Also $12,000 bonds for constructing sewers in West End Sewer District, and $1,400 bonds for constructing sewers in various streets. F. W. Bauer is City Auditor.

Erie, Pa.—Erie will shortly start erection of experimental station for treatment of sewage. Appropriation of $10,000 has been made for this purpose. Plant will be forerunner of real sewage disposal plant in the city, it is believed.

Williamsport, Pa.—Bill No. 30, providing for construction of storm sewer in Erie Ave. has been passed.

Columbia, S. C.—City will receive bids on June 2 for the $500,000 bonds recently authorized to extend sewer and water system. W. H. Gibbes is Mayor.

Corpus Christi, Tex.—Balance of $20,000 sewer bonds have been sold.

Granger, Tex.—As result of petition signed by number of leading ctiizens of Granger, City Council has ordered election to be held on April 7 to be authorized to issue bonds of $15,000 to construct sewers.

Houston, Tex.—Ordinance providing for issuance of $100,000 worth of drainage sewer bonds has been prepared by legal department of city and will be presented to council for approval.

Alexandria, Va.—It is expected that many sewers will be laid this summer.

Everett, Wash.—Construction of big sewer in south end is urged.

CONTRACTS AWARDED.

Los Angeles, Cal.—By Board of Public Works, contract for construction of Arroyo de La Brea storm sewer system, to R. C. Lowell, 228 West Lemon Ave., Monrovia, Cal., at $662,063.

Alton, Ill.—Bids have been opened by Board of Local Improvements for two sewer jobs, on Seventh St. sewer and the Ninth St. sewer. Bids are as follows: Seventh St. Sewer—Arnold Construction Co., 6-in. sewer pipe, 38 cts. per ft.; 8-in., 61 cts.; 10-in., 40 cts.; 12-in., 69 cts.; 15-in., 90 cts.; manholes, $44; catch basins, $33. Ninth St. Sewer—Broocker & Grabbe, 6-in. pipe, 35 cts.; 8-in., 55 cts.; 10-in., 65 cts.; 12-in., 80 cts.; 15-in., 95 cts.; manholes, $35; catch basins, $30. Seventh St. Sewer—Broocker & Grabbe, 6-in. pipe, 35 cts.; 8-in., 55 cts.; 10-in., 65 cts.; 12-in., 80 cts.; 15-in., 95 cts.; manholes, $35; catch basins, $30. Ninth St. Sewer—Charles Degenhardt, 6-in. pipe, 50 cts.; 8-in., 80 cts.; 10-in., 80 cts.; 12-in., 90 cts.; 15-in., $1.30; manholes, $50; catch basins, $34. Seventh St. Sewer—Charles Degenhardt, 6-in. pipe, 50 cts.; 8-in., 50 cts.; 10-in., 75 cts.; 12-in., $1.05; 15-in., $1.25; manholes, $48; catch basins, $31. Ninth St. Sewer—E. E. Rutledge Co., 6-in. pipe, 32 cts.; 8-in., 65 cts.; 10-in., 50 cts.; 12-in., 85 cts.; 15-in., $1; manholes, $50; catch basins, $40. Seventh St. Sewer—E. E. Rutledge Co., 6-in. pipe, 32 cts.; 8-in., 65 cts.; 10-in., 50 cts.; 12-in., 85 cts.; 15-in., $1; manholes, $50; catch basins, $40. Seventh St. Sewer—H. H. Belser Co., 6-in. pipe, 35 cts.; 8-in., 40 cts.; 10-in., 60 cts.; 12-in., $1.10; 15-in., $1.20; manholes, $35; catch basins, $35. Ninth St. Sewer—H. H. Beiser, 6-in. pipe, 35 cts.; 8-in., 40 cts.; 10-in., 60 cts.; 12-in., $1.05; 15-in., $1.25; manholes, $35; catch basins, $32.50. Ninth St. Sewer—H. R. Wolf, 6-in. pipe, 34 cts.; 8-in., 51 cts.; 10-in., 50 cts.; 12-in., 68 cts.; 15-in., 89 cts.; manholes, $39; catch basins, $30. Seventh St. Sewer—H. R. Wolf, 6-in. pipe, 34 cts.; 8-in., 47 cts.; 10-in., 48 cts.; 12-in., 65 cts.; 15-in., 90 cts.; manholes, $38.50; catch basins, $28.50. H. R. Wolf was declared the lowest bidder on both jobs and the contracts will be awarded to him after ten days' notice is given.

East Moline Ill.—Contract for installation of sewers in Watertown addition of East Moline, to Moline Heating & Construction Co., Moline, at $13,600.

Davenport, Ia.—For construction of about 18,000 ft. of 6 to 15-in. sewers in 13th District, to D. E. Keeler, Davenport, at $18,206. Noted March 5.

St. Paul, Minn.—Contracts for sewer construction have been awarded as follows: Sewer on Armstrong Ave., between Chatsworth St. and Pleasant Ave., E. T. Webster, $1,191; sewer on University Ave., between Pascal and Hamline Aves., E. T. Webster, $2,050; sewer on Fuller Ave., between Victoria and Fisk Sts., Christ Johnson, $607.60; sewer on Blair St., from Farrington to Virginia Aves., Christ Johnson, $235; sewer on Alice St. from Ohio St. to a point 190 ft. west, Feyen Construction Co., $497.

Charlotte, N. C.—To J. B. McCrary Co., of Atlanta, for installation of sewer system in Rowland and Sylva.

Columbus, O.—By Board of Control, to J. F. Ryerson, for construction of sewer on Livingston Ave., at $8,084.

WATER SUPPLY

San Francisco, Cal.—Fire Commission has recommended to Supervisors that cistern with capacity of 100,000 gallons be constructed at intersection of 32d and Lake Sts., as requested by Baker's Beach Heights Improvement Club, and that Spring Valley mains be extended through district.

Daytona, Fla.—Special meeting of town council was called for purpose of considering proposition to bond town for water system in sum of $22,500, widen streets, $1,000; for street improvement, $3,000; at which acting mayor was requested to submit same to vote of people at coming election, March 28.

Galesburg, Ill.—Ordinance has been adopted providing for issuing $75,000 bonds for payment of necessary expenses of further developing additional water supply for City of Galesburg.

Nickerson, Kan.—Council has voted to submit bond proposition to voters this spring to vote $25,000 for city water works system.

De Quincy, La.—Bond issue of $16,500 is being considered to cover cost of con-

struction of a municipal waterworks plant.

Shreveport, La.—City Council has ordered election held April 15 for property owners to vote on proposition of authorizing $1,000,000 of bonds to buy present waterworks or construct new system.

Saginaw, Mich.—Details are being arranged for special election to vote on bond issue of $700,000 to provide for consolidated water station and softening and filtration plant.

Chillicothe, Mo.—Ordinance requesting city council to call special election to vote on question whether or not city shall issue $100,000 in five per cent. bonds to buy or build water plant, has been presented to city council by F. L. Maxwell, councilman from the First ward. No action was taken, it being held up until the next regular meeting, March 16, when ordinance will be passed and approved and date set for holding of election.

Billings, Mont.—Bids for 2,500 ft. of pipe to conduct water from Gray Eagle ditch to supply gravity system and municipal swimming pool at South Park will be advertised for at once by City Clerk L. E. Torrence. Work on construction of system will be started as soon as pipe is delivered.

Clyde Park, Mont.—Preparations are complete for special bond election to be held on April 6 to vote on question of issuing municipal bonds to amount of $180,000 for construction of waterworks system for Clyde Park.

Columbus, Mont.—Bids will be received by G. A. Westover, Town Clerk, up to 8 p. m., March 31, for purchase of $30,000 bonds for purchasing water plant and procuring water supply to be owned and controlled by said town.

Roundup, Mont.—The $60,000 city waterworks bond issue has been sold at public auction in council chambers of city. They were bought by Continental Trust and Savings bank of Chicago for $62,650.

Asbury Park, N. J.—Plans have been made for extensions to present water system. S. H. Colvert is City Clerk.

Orange, N. J.—A new storage reservoir and mechanical filtration plant are recommended as needed to increase and protect Orange water system, in report from Hering & Gregory, consulting engineers, presented to Common Council. It is estimated cost of reservoir and plant would exceed $463,000. Report has been referred to water and street lighting committee. Engineers recommend construction of large reservoir, having capacity of 530,000,000 gallons, in ravine between present upper reservoir and Campbell's Pond reservoir, west of Orange Mountain. Engineers provide for supply for population estimated at 60,000 in 1940. Engineers also recommend immediate construction of reservoir and dam, pipe line additions to increase the delivery capacity to 500,000 gallons, and pumping station extensions at total estimated cost of $361,900, and further recommend that in near future city take up installation of filtration plant, cost of which is estimated at $101,750. Until filtration plant is erected engineers recommend installation of sterilizing apparatus at pumping station to safeguard consumers from present possibility of pollution.

New Paltz, N. Y.—Village will authorize bond issue for purchase of water works.

Rowland, N. C.—The $30,000 in bonds issued by Town of Rowland for waterworks and electric lights have been sold to Hoehler-Cummins-Prudent Company, Toledo, O.

Cincinnati, O.—Ordinance to issue $604,000 worth of bonds for laying the 36-in. water mains has been passed under suspension of rules. Service Director was given authority to spend $20,000 for cleaning of water mains of city during year 1914.

Cleveland, O.—City will increase its bonded indebtedness $2,500,000 between March 30 and June 30 for purer water. Of this $1,200,000 is to go for river purification and $1,300,000 for new filter plant. About $900,000 is being spent on new west side tunnel to provide better water for new filter plant.

Sandusky, O.—Construction of new water works intake pipe is being considered.

Newville, Pa.—Purchase of water plant is being considered.

Columbia, S. C.—City will receive bids on June 2 for the $500,000 bonds recently authorized to extend water and sewer system. W. H. Gibbes is Mayor.

Casselton, S. D.—Bond issue is being considered for installation of water works.

Spencer, S. D.—Petition is being circulated asking that town board submit to voters at spring election question of bonding town for water works.

Yankton, S. D.—Resolution to call special election of voters of city of Yankton, to authorize issuance of $60,000 waterworks bonds, has been adopted.

Chattanooga, Tenn.—Municipal ownership of water works is being discussed.

Sweetwater, Tex.—Bonds in sum of $320,000 have been voted for building of municipal water plant.

Teneha, Tex.—Plans are being discussed for installation of water works system.

Texarkana, Tex.—Municipally owned water works plant on east side is being considered.

Norfolk, Va.—Resolution to appropriate $75,000 for extension of water meter system of city has been approved by finance committee.

Eugene, Wash.—Water Board is planning to gradually install water meters throughout city.

Hoquiam, Wash.—Plans of City Commission to take definite action towards eventual establishment of municipal water system are shown by resolution adopted. Most available water supply is located in that part of drainage basin of west fork of the Humptulips River, within forest reserve, resolution says, and pipe line would be about 30 miles in length.

Kelso, Wash.—After three years or more of surveys, resurveys and other preliminaries, bids for construction of Mount Solo dike project are to be called. Project is one of most important of its kind in this section, work being estimated at $115,000. Contractors bidding on work will be expected to accpt $20,000 cash and bonds for remainder.

Racine, Wis. — Preliminary steps toward building dam across Root River, near Cedar Bend have been taken at regular monthly meeting of park board. Such a dam is expected to cost between $2,000 and $3,000.

CONTRACTS AWARDED.

Douglas, Ariz.—T. M. F. Dicus Co., at $21,000, for furnishing materials for new water main.

Tucson, Ariz.—The Griffith Construction company of Tucson has been awarded contract for construction of concrete pipeline and concrete reservoir of new water works improvements by city council. Their bid was $70,972 for pipe line and $13,660 for the reservoir, a total of $84 632.

Lamar, Colo.—By City Council to Filoon & Clark, Lamar, for construction of about 2 miles of line connecting city mains with reservoir at $16,969. Other bidders were: J. S. Schwartz, Colorado Springs, $17,859; Smith & McDowell, Pueblo, $18,106; Peter O'Brien, Denver, $17,782; Fisher-Dempsey Co., Pueblo, $21,600; Marshall Bros., Las Animas, $21,855.

Walsenberg, Colo.—By Town Trustees to Grazier & McCabe, of Boulder, for constructing water works, at $22,833. C. Victor Mazzone is Town Clk.

Farmington, Ill.—For improvements to water system, including one McGowan triplex pump, one 700-gal. centrifugal fire pump and two electric motors, to Western Pump & Engineering Co., Chicago, Ill.

Maywood, Ill.—To Western Pump & Eng. Co., Ry. Extension Bldg., Chicago, for two air compressors, 5 electric motors, 3 centrifugal pumps, wiring and piping for village.

Highland Park, Mich.—For construction of reservoir, to Delisle & Cooper, of Detroit, at following bid: 7,960 cu. yds. excavation, 45 cts.; 4,564 cu. yds. embankment, 22 cts.; 304 cu. yds. floor lining, concrete, $6.25; 42,660 lbs. floor lining, steel, 3.8 cts.; 487 cu. yds. slope lining, concrete, $8; 58,154 lbs. slope lining, steel, 3.8 cts.; 3 cu. yds. overflow weir, concrete, $10.50; 35 ft. overflow pipe, laid, 65 cts.; 3½ cu. yds. supply well, concrete, $12; 48 ft. supply pipe, laid, $4; 150 ft. unwaterment drain, laid, 80 cts.; 1,752 ft. embankment drain, laid, 70 cts.; Michigan 12-in. water gate, $60.04; reservoir railing, complete, $923.50; 1,800 sq. yds. sodding bank, 10 cts.; 3,400 cu. yds. for overhaul, 60 cts.; for work and material not herein specified, at cost and 12 per cent. less overhaul, $2,040; total, $15,960. Totals of other bids: Otis Cement Contr. Co., Detroit, $22,023; Jos. P. Rusche, Grand Rapids, $26,944; Arthur H. Bennett, Detroit, $17,804; Geo. R. Cooke, Detroit, $21,451; A. J. Smith Contr. Co., Detroit, $17,685; John T. Halbridge, Detroit, $22,539. L. D. Beckley is Supt. Pub. Wks.

Dorchester, Neb.—Contract for construction of water system, to Alamo Construction Co., Omaha, Neb., at $13,000. M. M. Wall is Clerk.

Gering, Neb.—For constructing water works system, by Village Council, to Inter-Mountain Bridge & Construction Co., Tecumseh, Neb.

Newark, N. J.—By Board of Works, contract to United States Cast Iron Pipe & Foundry Co., 71 Broadway, New York, N. Y., at $26,030, for c.-i. pipe and special castings for high-pressure water system.

Rochester, N. Y.—The United States Cast Iron Pipe Co. has been awarded contract for furnishing 8,870 tons of cast iron pipe for Hemlock conduit, by Board of Contract, for $199,880. The Camden Iron Works, of Philadelphia, submitted lower bid, but failed to comply with rules as to bidding. The R. T. Ford Co. was awarded contract for hauling and laying the pipe at $138,327. Frank Cristurie was low on this work, but failed to comply with the rules governing the bidding. Contract for furnishing pipe for water mains was awarded to Camden Cast Iron Co. for $138,413.65. The Rensselaer Water Works Co., of Troy, was awarded the contract for furnishing valves on new conduit line at $6,140.

Charlotte, N. C.—The J. B. McCrary Company of Atlanta, through its local representative, Mr. H. W. Loving, has recently signed contracts for installation of water, lighting and sewer system in Rowland, to cost about $45,000 and also water and sewer system for Sylva, to cost about $50,000.

Cleburne, Tex.—Briggs, Weaver & Co., of Dallas, have been awarded contract for erection of apparatus to cool water at waterworks plant. Contract price was $2,980. Cooling vat is to be 45x85 ft. to five feet deep.

LIGHTING AND POWER

Newport Beach, Cal.—City is again advertising for sale issue of $25,000 bonds that were voted in September, 1912. Bonds were voted for purpose of installing municipal light plant.

South Pasadena, Cal.—South Pasadenans living in Oneonta district are launching movement for comprehensive lighting system. Ornamental lamp posts are planned, and it is hoped to have entire section thoroughly equipped in near future.

Bridgeport, Conn.—Petition from Samuel Dawe and others asking that white way be extended on East Main St. from East Washington Ave. to Ogden St., has been referred to committee on lamps. Similar petition asking that white way be extended on Main St. from Congress St. to Fulton St., signed by Home Brewing Co. and others, has also been referred to same committee.

St. Petersburg, Fla.—Bond issue of $148,000 has been voted for establishment of municipal gas plant. J. B. McCrary Co., Atlanta, prepared plans, etc.

Indianapolis, Ind.—Board of Park Commissioners has under consideration substitution of electric lighting system for gas and gasoline lighting system now used in city parks, and proposed new system may also be extended to boulevards. Plan considered by Park Board is to use ornamental lighting posts surmounted at top by ornamental glass globe, which would inclose 75-watt tungsten lamp.

Mason City, Ia.—Citizens have decided to issue $50,000 bonds for construction of municipal electric light plant. W. A. Judd is City Engr.

Pittsburg, Kan.—City commission has granted petition requesting installation of pedestal lighting system on Third St., from Locust St. to Elm St.

Severance, Kan.—C. I. Stocking, Hiawatha, Kan., will prepare plans for construction and operation of municipal electric light plant.

Grand Rapids, Mich.—City wires are to be placed in conduits.

Duluth, Minn.—Petition is being considered for installation of "white way" on Superior St., between 18th and 22d Aves.

Hibbing, Minn. — Representatives of many concerns furnishing material for white ways have been heard by water and light commission, and various tenders were taken under advisement after long consideration. Village wants 460 standards and other material. White way improvement contemplated is most extensive in this section. Figures presented at water and light commission as to extent of white way work planned showed there would be 460 standards, 14 miles of conduits and 25 miles of wire and that total cost of the proposed improvement would be about $30,000.

Wilmont, Minn.—Plans of Water and Light Commission to replace equipment

of electric plant, and to increase its output, have been approved by City Council. Cost of improvements is estimated at about $14,000.

Wilsall, Mont.—C. D. Hefferlin, a Livingston capitalist, has made application to board of county commissioners for franchise to establish electric plant at Wilsall.

Linden, N. J.—Citizens of Linden will decide upon bond issue of approximately $33,000 and also determine upon advisability of entering upon five-year contract with Public Service Electric Company for lights at special election to be held in township Wednesday, April 22.

Millville, N. J.—Installation of electric lighting system is being discussed.

Port Norris, N. J.—Contract to furnish about 100 gas arc lights for streets of Port Norris has been awarded to Millville Gas Light Co.

Niagara Falls, N. Y.—Plans for installation of decorative lighting system in residential district about Portage Road will be shortly presented by lighting committee.

Saratoga Springs, N. Y.—Election will be held March 24 for voting on bond issue of $9,000 for purchase of lighting portions of Broadway and Division St. by ornamental pole lighting system. J. J. Davis is village clerk.

Silver Creek, N. Y.—See Miscellaneous.

Rowland, N. C.—Electric light and waterworks bonds in sum of $30,000 have been sold to Hoehler-Cummins-Prudent Company, of Toledo, O.

Toledo, O.—Ordinance has been passed authorizing director of public safety to enter into contract with lowest and best bidder, after due advertising according to law, for purchase of approximately 450 feet of submarine cables for use in sub-department of fire and police alarm telegraph. A. W. Payne is clerk of council.

Youngstown, O.—Strong plea has been made for better lighting system.

Portland, Ore.—By County Commissioners 3-year contract to Portland Railway, Light & Power Co. for furnishing arc and incandescent lights. Price named is 2¼ cts. a kilowatt hour, same price city is paying and ¼ ct. less than old price. Northwestern Electric Co. had agreed to furnish limited supply for 2 cts.

College Hill, Pa.—Plans are being considered for installation of "great white way."

Erie, Pa.—Sum of $42,000 will be provided in budget for construction of State St. conduits.

Anderson, S. C.—Installation of "white way" is planned for around plaza.

Elk Point, S. D.—City Council has sold $25,000 in bonds for installing electric light system.

Pasco, Wash.—City Attorney Ryzek has been instructed to make investigations relative to cost of installing municipal electric light plant.

CONTRACTS AWARDED.

Abbeville, La.—By City Council, together with their advisory committee, let a contract to the Snow Engine Co. recently for an internal combusion oil engine which will be used to operate the electric light and water works plant here. The contract was for an engine of 110 HP., together with an electrically driven pump for the water works, the contract price being approximately $8,000.

Decatur, Neb.—By Village Board, for construction of light plant, to Hastings Electric Shop, of Yankton, S. D., at $4,975.

Sag Harbor, L. I., N. Y.—The Sag Harbor Lighting Co., of Manhattan and Sag Harbor, has accepted franchise granted by Village Trustees of Southampton to supply gas.

Charlotte, N. C.—To J. B. McCrary Co., of Atlanta, for installation of lighting system for Rowland.

Erie, Pa.—The Erie Lighting Co. has been awarded contract for lighting city hall until Jan. 1, 1915. There were but two bidders for work, the Erie Lighting and the Erie County Electric Co. Bids were, for first 100 kilowat hours, 7c. per hour; for the first 2,000 kilowat hours, 5c. per hour, and for all over 2,100 kilowat hours per month, 4c. per hour. Contract for heating the city hall was awarded to the Erie Home Heating Co., they being only bidders.

Provo, Utah.—Contract has been entered into between Provo city and Utah Power & Light Co. for fifty 6.6 ampere luminous 510-watt lamps to be furnished city for street lighting at $5.50 each per month. Lamps will be placed on following streets: Fifth West, Third West, Academy Ave., Center, Third South and Fifth South.

Seattle, Wash.—For supplying copper wire to Standard Underground Cable Co. at $11,747.

FIRE EQUIPMENT

Douglas, Ariz.—Purchase of two motor tractors is being discussed.

Phoenix, Ariz.—Plans and specifications for two outlying fire stations, for auto fire engine and auto for chief, and installation of complete fire signal system have been read and adopted at meeting of city council. City attorney was instructed in each case immediately to draw up advertisements for bids on all and to submit them for immediate publication.

San Francisco, Cal.—Construction of new fire alarm station in Jefferson Sq., according to plans prepared by the city architects and City Engineer, is to be ordered by Board of Supervisors, Finance Committee having so recommended. Plans and specifications for equipment of station are now to be prepared, and in framing them City Engineer's department is to consult with Chief Nixon of Department of Electricity. Equipment may cost about $50,000.

San Francisco, Cal.—At special meeting to discuss budget for ensuing year, recommendations will be made that Board of Supervisors appropriate $450,000 for substituting motor vehicles for balance of horse-driven apparatus.

Atlanta, Ga.—Mayor Woodward has addressed communication to General Council, recommending that fire and police alarm system installed by Okonite Co. be purchased for $87,500.

Atlanta, Ga.—Bids will be asked at once for fire apparatus for new fifth ward station. Specifications will call for combination auto pump and hose wagon, guaranteed to deliver not less than 800 gals. per minute, and to have carrying capacity for 1,000 feet of 2½-in. hose.

Chicago, Ill.—Ordinance has been adopted providing for issuance of Fire Department Building bonds in sum of $1,000,000.

Fort Wayne, Ind.—New building for fire alarm system is being considered.

Ponchatoula, La.—City Council has ordered purchase of chemical engine.

Attleboro, Mass.—Sum of $600 has been appropriated for purchase of 1,000 ft. of hose, and $3,000 for purchase of tractor to be placed on Ladder 3.

Billerica, Mass.—Town will vote on $5,500 appropriation for purchase of auto combination truck for fire department.

Clinton, Mass.—As was provided in Article 22, $1,500 was appropriated for purchase of new hose for fire department and for repairing fire alarm system.

Gloucester, Mass.—Sum of $350 has been appropriated for purchase of new hose for fire department.

Taunton, Mass.—Sum of $3,500 has been appropriated for purchase of motor chassis for combination wagon at Weir Station.

Jersey City, N. J.—Board of City Commissioners have thrown out all hose bids, and will readvertise upon new set of specifications.

New Brunswick, N. J.—Resolution has been adopted authorizing fire committee to advertise for new fire hose, to cost not more than $2,000, and authorizing fire committee to purchase new brake for Raritan Engine Co.'s apparatus at cost of $150.

Dunkirk, N. Y.—Police and fire commissioners have made specifications for changing combination hose and chemical wagon of Hose Co. No. 1 into motor-propelled vehicle. Resolution has been adopted to advertise for bids for motors, from 40 to 60 hp. and for a chassis.

Frankfort, N. Y.—Proposition to install fire alarm system has been carried.

Lockport, N. Y.—Board of Fire Commissioners will take action on proposition to buy combination auto chemical engine and hose wagon. Estimated cost is $9,000 and it is expected that truck will do work of three horse-drawn fire wagons.

North Tonawanda, N. Y.—Fire commissioner of this city has voted to buy auto hook and ladder truck for Columbia Co. of Oliver St. Estimated cost, $7,000.

Cleveland, O.—Bids will be received at office of Sinking Fund Commission, room 507, City Hall, until noon, March 30, for purchase of $50,000 Fire Department coupon bonds. Wm. Damm is City Treasurer.

Linnton, Ore.—City will erect modern fire station.

Johnstown, Pa.—Purchasing Agent Nathan Miller has been instructed by Council to advertise for bids for 2,000 ft. of fire hose, which city expects soon to purchase.

Johnston, Pa.—Bids will be advertised for about 2,000 ft. of fire hose.

Newville, Pa.—Purchase of firefighting apparatus is being considered.

Scranton, Pa.—Mayor Jermyn has signed ordinanc transferring $38,900 in funds so that motor truck apparatus can be purchased.

Noank, R. I.—Purchase of new hose is being considered.

Woonsocket, R. I.—Joint standing committee on finances, in its report to Woonsocket City Council on anual budget of appropriations, recommends $56,000 for fire department and $21,000 for hydrants.

Alexandria, Va.—Work of erecting new house for Relief Hook & Ladder Fire Co. will be begun at an early date. At meeting of joint committee on fire and public property of City Council recently it was decided to advertise for bids for erection of structure, which will cost $10,000. House will be located on north side of Prince St., between Royal and Fairfax Sts.

CONTRACTS AWARDED.

Frederick, Md.—To Fabric Fire Hose Co., New York, contract for 400 ft. of hose.

St. James, Minn.—To W. S. Nott Co., of Minneapolis, for 500 ft. of hose.

Schenectady, N. Y.—At meeting of city board of contract and supply contracts were placed for 1,000 ft. of 3-in. fire hose with C. C. C. Fire Hose and Rubber Company of Canton, Mass., and 1,500 ft. of 2½-in. hose with Voorhees Rubber and Manufacturing Company of New York, also for automobile for Deputy Fire Chief August Derra to cost $994.50, with Martin Litzendorf.

Urbana, O.—By Board of Control contracts for 1,000 ft. of fire hose. The Queen City Supply Co., of Cincinnati, secured contract for 500 ft. of Imperial 2½-in. hose, double jacket, rubber lined at its bid of 73 cts. a ft.; total $365. Boston Woven Hose & Rubber Co. contracted to supply 500 ft. of Boston Special 2½-in. hose, double jacket and rubber lined at 90 cts. a ft.; total $450.

Hanover, Pa.—To American-LaFrance Fire Engine Co., of Elmira, N. Y., for supplying motor fire truck at $9,000.

Millvale, Pa.—For furnishing 1,000 ft. of hose to Fabric Fire Hose Co., New York City, at $1 per foot.

Sharon, Pa.—To Republic Rubber Co., of Youngstown, O., contract for 950 ft. of hose at 76 cts. per ft.

BRIDGES

South Bend, Ind.—Contract between County Commissioners and Charles B. Cole, city engineer of Mishawaka, whereby latter is to furnish on or before May 1, 1914, plans and specifications for new steel and concrete bridge over St. Joseph River on North Michigan St. has been approved by County Commissioners.

Salina, Kan.—Monday, April 20, has been decided upon as date for special election to be held in this county for purpose of deciding by general vote on resolution of county commissioners for appropriation of $26,000 for Iron Ave. bridge in city of Salina.

Topeka, Kan.—County engineer has been instructed to prepare plans and specifications to be submitted to County Commissioners and Topeka Railway Co. for prospective bridge across Ward Creek on West Eighth Ave.

Salem, Mass.—County Commissioners have opened bids for removing present wooden bridge over Parker River on the Newburyport Turnpike, in Newbury, and replacing it with reinforced concrete bridge 180 ft. long, resting on three piers and two abutments and grading and surfacing the approaches. There were six bids as follows: Hancock Engineering Co., of Boston, $27,448.65, no time given for completion; Bendle & Stoddard, of East Boston, $28,236.75, to be completed Sept. 1; Holbrooke, Cabot & Rollins, Inc., of Boston, $31,285, to be complete on Nov. 1; John W. Buswell, of Salisbury, $32,407, to be completed on Oct. 15; William H. Ellis, of East Boston, $46,570, to be completed January, 1915. Bids were taken under advisement.

Grand Rapids, Mich.—Council has voted to place before people another bonding proposal of $138,000 for erection of cement bridge at Pearl St.

St. Paul, Minn.—Park Board will shortly advertise for bids for construction of four new bridges across canal at Phalen Park, to cost $72,000. Plans for bridges have been prepared by Fred Nussbaumer, Supt. of Phalen Park.